electrical contracting

With which is consolidated The Electragist and Electrical Record
Established 1901

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FEBRUARY, 1938

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FEBRUARY, 1938

Better Than Whistling

EVER SINCE OLD PITHECANTHROPUS ERECTUS SWEATED in the Java jungle, men have taken their hot weather just as the Good Lord dished it out. For fifty million years or so, it has been a well established custom.

THERE HAVE BEEN COMPLAINTS, of course. And despite Mark Twain, some people have tried to do something about it. In India, the nabobs used lattice doors covered with rushes. Slaves kept them wet. The hot wind blew. Evaporation made the first air conditioning unit.

BUT NOW SCIENCE STEPS IN. Summer heat is out the window, if we put it there. Indoor weather control is easy. One of the richest markets we have yet touched is opening to us. But there is one thing wrong.

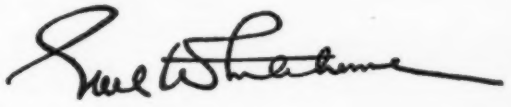
ENTHUSIASTS HAVE SOLD their idea to John and Mary too well, with cool theatres, restaurants, stores, railway cars. "Some day," says Mary, "we'll have our house air conditioned, too." And John answers—"Some day, maybe. But it costs a lot of money."

THEY BOTH BELIEVE that summer comfort calls for an expensive installation of ducts, blowers and refrigeration. They're thinking of a year round, engineered job—at once. And so countless people, who should be starting with kitchen exhausts and attic fans and going on to cooling units for single rooms, are waiting for "a lot of money."

THOUSANDS OF ELECTRICAL CONTRACTORS also have been bluffed by this same idea. They think "air conditioning" is over their heads. They forget that meanwhile they can be selling ventilation and building up customers for later air conditioning.

SOME CONTRACTORS ARE NOT YET EQUIPPED to install complete summer and winter plants. Some are. Some never will be. But any contractor can sell ventilation. And through this preparation, many more will develop successful air conditioning departments. So every contractor has a place in this market—right now.

OLD TIME SAILORS, IN A CALM, were supposed to whistle for a wind. A lot of contractors are still pretty good at wishing for business. Well, here is wind that blows in business. But whistling won't bring it. Hustling will.



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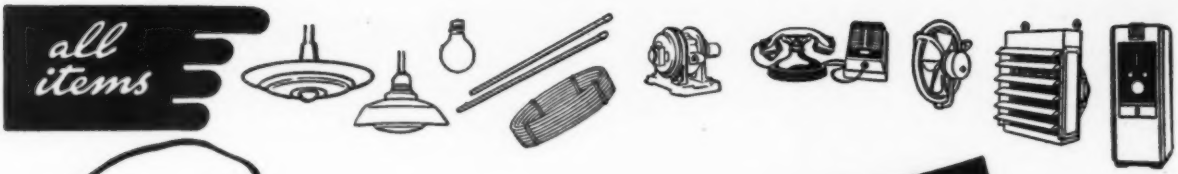

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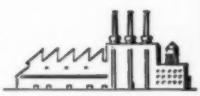
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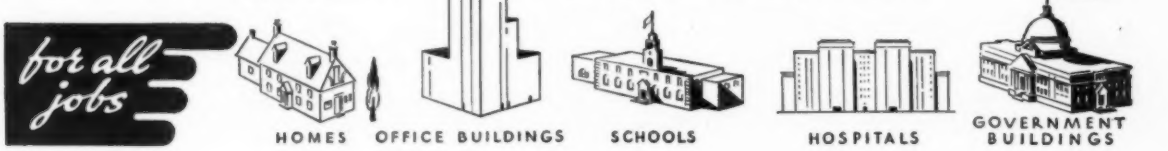

An Idea to Kill

Why the Power Men are Wrong about the Cost of Wiring

THE CAT *is the thing—not the peach tree.*

By Earl Whitehorne

ONCE upon a time I had a cat to kill. I had been married about a year and built a little new house with a big fireplace in the living room and water in the cellar. We were well organized with a canary, eight gold fish, an English coach dog that jumped on the beds, a big black tom cat and a Finnish maid with a lover.

The cat's name was Oscar and he was full of passion. Lady cats, with hunger in their hearts, would come to him in the night and they would squawl together. Oscar had a voice and a verve truly artistic. I threw boots, books brushes and bric-a-brac but he continued to pour forth his soul and ravish sleep. Finally it led to a domestic crisis and a neighborhood revolt. I gave in and took old Oscar for a ride.

But the cat came back. I chloroformed him and he broke out—after death. My next door neighbor was then invited to try his shot gun. He accepted with genuine enthusiasm. But Oscar wouldn't stand still. Finally in desperation and in shame I put the cat in a gunny sack and laid him on the lawn. The neighbor took aim. Oscar squawled. The shot went wild and cut down a young peach tree, that we were nourishing with tender care.

I opened the sack. Oscar came forth and rubbed against my leg. I escorted him in and fed him the canary and the gold fish. I gave him a key to the front door and told him that the night was his and to make merry. I decided that this free love idea was too old for me to change.

Despite these bitter memories, however, I find myself once more rising to challenge another idea. And because this idea is neither so old nor so deep rooted in tradition, I think something can be done about it. I am talking of the idea that has prevailed so long among power company men, that you can't sell wiring because it costs too much—and that the way to solve the problem is to reduce the cost of wire.

Recently I had some correspondence with an old friend, who is vice president of a middle western power company. In it he plainly sounds the issue as the power companies see it. I respect the sincerity of his opinion, but I also believe that this attitude of the utility men is doing great harm in the industry.

This vice-president writes:

"Utility companies feel that cheaper wiring means more wiring. Are they wrong in this assumption or are they right? It seems to me this question should be argued on this basis, not on that of other elements involved in the question."

The answer to his question it seems to me is easy to find. In the abstract, the contractor will freely agree that cheaper wiring would be easier to sell. But that is not what the argument has been about at all. The battle has raged around two other questions that are quite different. They are—

1. *Does wiring now cost too much to be freely sold?*

2. *In what part of the wiring operation can we best cut costs?*

Now, this is something else. But

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any discussion of this issue must consider these two questions first. Otherwise we are aiming at the cat and shooting the peach tree. But first I'd like to tell the interesting little story of how it all started.

Back about the year I was trying to murder Oscar, an old timer, Sam Doane, went to Europe. Sam Doane was a lamp man in Cleveland, a smart egg, a fine chap, a leader, now no longer in the electrical industry. He spent several years in England and on the Continent. He saw that they were wiring houses by nailing up concentric cable along the walls.

Sam Doane came back and preached the gospel of cheap wiring. It sounded good to many power company men, They seized upon the idea of making wiring easier to sell by using wire that's cheaper to put in.

But the inspectors were against it. They pointed out that houses here are built of wood and that our installation practice did not provide those restrictions to service that made concentric wiring safer to use abroad.

The contractors were against it. They argued that we spend more for quality, build on a more lavish scale. They maintained that the cheaper wire was not fitted to our markets and our needs.

The manufacturers were against it. Our whole electrical system of construction and service, they insisted, has been built up on a high standard of safety and performance and these standards should not be lowered. But anyhow some American concentric wire was manufactured, if I remember right, and installed on trial in several cities.

But this resistance simply strengthened the conviction of Sam Doane and his converts. In the course of a few years perhaps a dozen men became the standard bearers in a crusade for cheaper wire. I know them and I honor them for their initiative and courage. I like crusaders. I tilt a wind mill myself upon occasion.

THE CAT *is the thing—not the peach tree.*

In this case, however, the crusade unfortunately got off the track. Instead of aiming at the cat it got to shooting the peach tree. For despite their constructive purpose, these men let their enthusiasm for an idea warp their perspective. They had not been successful in getting people to buy wiring on the scale that was needed. They assumed that a cheaper form of wire would bring more adequate installations.

And when the inspectors, contractors and manufacturers would not agree, they girded on their golden armor and took up their shining swords. They believed that they were going to battle for the Lord. They have become zealots for a cause. But as a matter of fact, all the time they have been sniping at the peach tree. Unfortunately, however, they have unconsciously done worse than that.

Year after year in the Roman Senate, Marcus Cato rose in his place and with a voice of portent cried out "Carthage must be destroyed!" or words to that effect. At first nobody cared. But finally, by the influence of persistent repetition, sentiment grew until Roman hatred of the rival nation crystalized into implacable purpose. And Carthage *was* destroyed.

Just so, for fifteen years this little group of power company men has been shouting—"Wiring can't be sold because it costs too much!" And gradually the sheer weight of their continually expressed conviction has built up a wide belief that nothing can be done about wiring because it costs too much. No proof has been produced that this is true. It is an idea unsupported by evidence.

But the chorus of "can't" has continued unabated and the influence of this ceaseless repetition, this unending barrage of negative influence has done great injury to the progress of the electrical industry. It has provided the power men, the contractors, the manufacturers with an ever present alibi for not doing a better selling job. It has built up a spirit of hopeless frustration among electrical men that has made them afraid to really tackle this job of getting adequate systems of wiring into the building of America.

One day I sat in a Roanoke, Va. court room while a young lawyer from the north was arguing a case. He ran on interminably, discussing dry technicalities of the law and putting everybody asleep, when he noted the expression of exasperation on the judge's face. He paused and said—

"Your Honor, I hope I am not consuming too much of the court's time."

The judge gave him a withering glance. He waved his finger at him. He replied—

"Young man, there comes a point where we must consider the distinction between the consumption of time and encroachment upon eternity."

Well, a lot of people have felt that way about this crusade on the cost of wiring. But at last, thank God! a start has been made in the direction of creative selling. A National Adequate Wiring Bureau has been set up to do something about it.

It is because this movement is entitled to a break that I am writing this plain statement, which I fear will be offensive to many of my old friends among the power men. But the new Adequate Wiring Program must have enthusiastic support from all sides, if it is to accomplish anything important. It cannot succeed if it is to be hamstrung from behind by a continuing dirge of discouragement, of big men saying it can't be done.

Mass Selling Needed

And it can be done! Proof lies plain before our eyes that it is not price that makes the market. It is selling. Consider our experience with refrigeration.

Electric refrigerators were offered to the American home for ten years or more and almost nobody bought them. Automobile interests moved into the market. General Electric and Westinghouse came to life, when they saw General Motors invading their field. In all, some $25,000,000 was spent in five years to push refrigeration and now eleven million have been sold. And as if to prove it was not price, but selling that did it, some manufacturers launched a cheap line of boxes, to sell under $100 and it was a dismal failure.

The electric range languished for 25 years, because gas influence in the big city combination utility companies held it back. Now manufacturers are pushing electric cooking and it is selling—but not because ranges are cheap.

It is the same with wiring. Nobody in the country is worrying about the cost of wiring except the power companies. The public does not buy because it simply is not yet interested. And the efforts of the crusaders is not going to stimulate the sale of wiring enough to count. "Let's look at the record," as Al Smith used to say.

What is it now that these crusaders for cheaper wiring are trying to get done? I want to state their program

plainly—as I understand it—and make comments upon it. For I am not opposed to reducing the cost of wiring—within the bounds of safety. I am eager to see it done—because it undoubtedly will help to some degree. My criticism lies in that they are not aiming at the cat. They are shooting the peach tree. And in doing so they hurt the very cause they are working for. According to my observation over this period of years, here is what they have wanted—or now want—

1 They wanted Sam Doane's concentric wiring, but stopped by the weight of opposition, abandoned this idea. As I said, many houses were wired with it. None have been burned down by it. Maybe it would be all right in proper practice. I don't know.

2 They fought and bled to get Romex approved under the Code. It was a good fight, a fine contribution. I thought, when non-metallic sheath cable was accepted, that the crusaders would line up behind it, promote it locally and get it into more and more houses, with the saving effected applied to more outlets.

But that did not happen. The crusaders, elated, swept on trying to find a wire still cheaper. People said—"They are like the Two Black Crows." You will remember, one Crow said to the other—"Even if it was good, I wouldn't like it."

3 The next step was C.N.X. and the fight is on over that right now. But C.N.X. has receieved conditional approval for trial installations. It is being installed in Detroit and probably elsewhere on this basis. It will probably burn down no houses and be approved some day and bring another small reduction in the cost of wiring.

But this also in itself will sell no more wiring, unless a pressure of promotion is put behind it, when it is approved, to convert the new economy into added outlets. Otherwise little will have been accomplished. The history of Romex will be repeated, that's all.

So far we deal with history. Beyond that, what do these crusaders for cheaper wiring want? There are rumored to be other changes in Code practice listed in their program. I have heard the following talked about—

4 They want bare neutral pulled into conduit and as a part of duplex or triplex conductors.

5 They want to modify the rule that conductors may occupy only 40 percent of the space in a conduit.

6 They want the new thermoplastic compound "koroseal" insulation put on the market, to provide a tougher and smaller wire.

7 They want service cable allowed for interior wiring and relief from the specification of conduit as required in some hazardous locations.

8 They want conduit made in greater lengths.

THE CAT *is the thing—not the peach tree.*

I am not quarrelling with any of these ideas. I have no proof, out of my own experience, as to whether these things will be safe or not in actual practice. And it is natural enough that there should be this conflict between those who want change and those who defend things as they are. Progress comes through a compromise between this radical and conservative opinion.

But it is most unfortunate, that in this work of pressing for new wiring materials, the power company men have gone to shooting peach trees. They have confused the issue by representing the cost of wire as the cause of poor selling.

As a matter of fact, in a $100 house wiring job, the labor and overhead will cost, say, $50. The rest will be material. But only, about 20 per cent of this material cost will be for the conductors, or around $10. So if you cut the cost of wire by 10 per cent you have saved only a dollar or two. Additional economies may be found, of course, in developing new materials that require less labor to install.

At the same time, inspectors and contractors point out that much more could be saved on house wiring in many cities by reducing the cost of the service entrance arrangements required by the power companies themselves. I don't believe this is preventing the sale of wiring. I do believe that all possible economy should be introduced here as well as in the cost of wire. It should be prominent in this crusade, it seems to me.

Boil it all down, and my point is this. Let us have every possible reduction in the cost of wiring. That is only sensible. It will help our selling. But let us keep clear before us the fact that wiring does not now cost too much to be sold. In fact, it is only when we begin to really sell wiring in larger volume that we can expect the cost to come down.

The most important economies will be obtained through mass production methods more than through cheaper materials. That is the only way we will ever get more outlets and heavier circuits into the 22,000,000 homes that now need them. It is volume that will bring lower costs. It is always so—look at the automobile.

My friend the vice-president in his letter cites the range wiring situation. He writes—*"Cheap range wiring is not due to organized selling, but organized selling is made possible by cheap wiring."* Well, you know the story of the man who went down cellar, opened the furnace door and said "Give me some heat and I'll give you some coal." He didn't get warm.

Certainly, it is harder to sell ranges where it costs $50 to connect them up, than where the cost is $21. The $50 price is undoubtedly a barrier to sales and so it was when it used to be $100 in some cities I know. But how has the cost of range wiring been reduced?

There is only one way. Set up a real sales program to be promoted on a scale that will bring enough business to permit a man to specialize in it—to organize a range wiring operation that can run efficiently. Then get the contractors together and work out the wiring plan and price. That is what electric cooking is now waiting for in every city where the cost of range wiring is still too high.

Throw on the coal. The heat will come.

It is time to look the whole thing frankly in the face. You can't induce people to buy something they do not yet want, by making it just a little cheaper. If we are to have any luck in selling wiring we will have to sell it the same way that other industries have sold automobiles and radios and silk stockings and lip sticks.

This is not an easy job. We need all the hope, confidence and enthusiasm that we can build up to speed our selling. So let's quit saying "Wiring costs too much!" and get back on the track. Let's kill that idea and go forward. Let's stop shooting the peach tree.

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Wiring Coded FORM

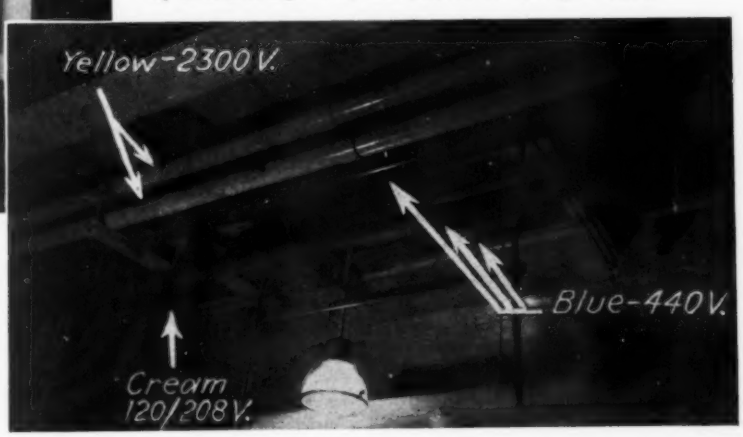
RISER CENTERS *usually involve complicated grouping of conduits. Here red, blue and white color identification is supplemented by plainly stencilled feeder and system identification.*

AN inexpensive scheme of color-coded conduits, numbered feeder pipes and stamped aluminum name plates for equipment, makes future electrical maintenance and system alternations relatively easy in the Nemours Building at Wilmington, Delaware. Here is one of the most modern of recently constructed office buildings, which required a maze of wiring for the lighting, power, air conditioning, signalling, communication and fire protection systems.

To maintain all these systems in future years, and also make changes in them as may be required, will never occasion guesswork. The entire system was carefully recorded just as it was installed, on complete electrical drawings. Moreover, the exposed conduits, cabinets and various units of apparatus are coordinated with these drawings in the identification scheme. And this coded electrical system was worked out in harmony with an extensive system

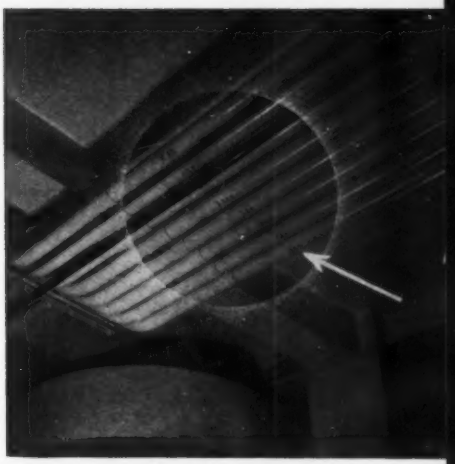
CONTROLLER GROUPS *at various places in the building have separate aluminum labels for each equipment unit.*

SYSTEM HAZARDS *are minimized for future maintenance crews. Here are 2300, 440, 120/208 and 110-volt circuit conduits which loom up in contrasting colors, with detailed numbering all along.*



R MAINTENANCE

This New Building Has Its Wiring System Clearly Identified to Eliminate Guesswork in Future Maintenance



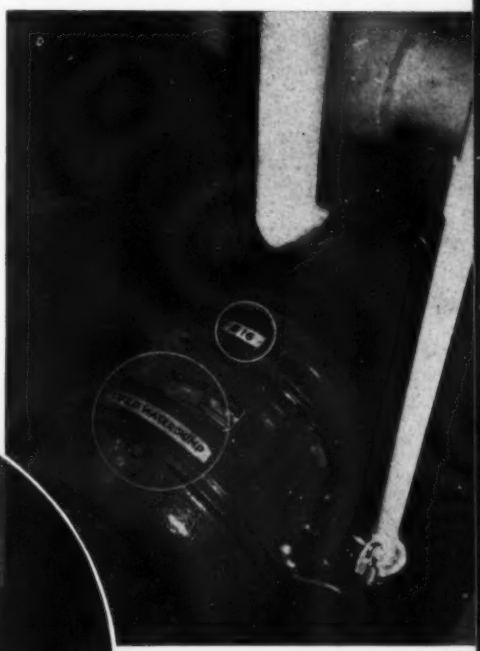
LONG FEEDERS, *like this group of eight 2½-in. conduits, can easily be traced to their junction points, because the stencilled feeder numbers, similar to those appearing on the wiring plans, are readable from the floor.*

of identification, covering all other piping and ducts which serve the complex facilities of this modern structure.

After all conduits were installed, they were painted in the following identifying colors: Red for conduits containing 11,000-volt conductors, yellow for 2300-volt, blue for 440-volt, cream for 120/208-volt, and white for 110-volt a.c. and d.c. circuits. Fire alarm conduits were painted white. Since the latter auxiliary systems are identified by being stenciled at all important junction boxes, and are generally isolated from conduit runs containing higher voltage conductors, these colors are duplicated.

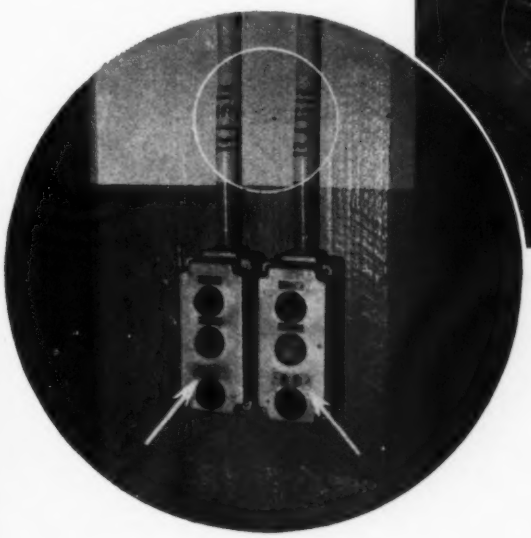
Each exposed feeder conduit was stenciled at frequent intervals at a place where the numbers were readable from the floor. At each motor, controller, control button and distribution center, the conduits were stenciled and aluminum name plates were placed on the equipment.

When the electrical design for this building was worked out by engineers of the Du Pont organization, this identification objective was all planned. The accompanying photos show how carefully these important details were carried out when the work was installed by the Wilmington organization of Hatzel & Buehler, Inc.



MOTORS, *too, bear dual identification, with the conduit connection also stenciled to carry out the complete scheme.*

EQUIPMENT LABELS *include, (1) a small numeral tag giving the unit number, and (2) a larger descriptive label, such as (left) "Cop. Dr. Water Cooler."*



CONTROL BUTTONS *also bear unit number tags, and the conduits are stencilled directly above.*

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Profits IN SMALL MOTORS

TINY ARMATURES *are wound rapidly on this machine. Steady production flow keeps costs down. (Above)*

•

STATOR VISE *holds the small stators in a convenient position for laying in the coils and making connections. This diminutive high cycle motor will deliver one horsepower to the tool. (Far left)*

•

BINDING AND CONNECTING *small armatures which are held in adjustable stands. Most of them are for portable tools.*

This shop specializes in tiny high-cycle motor repairs and is organized for mass production.

REWINDING small fractional horsepower universal motors is usually considered unprofitable business in the motor repair shop. The Jay Electric Company of Detroit, Michigan, however, has specialized in this field and built a big volume on little motors.

Their shop is organized to handle all kinds of motor and controller repairs but from its establishment, the greater part of the work has been fractional hp. universal and high cycle motors. W. J. Marcus, president and general manager, solicited the repair work of the portable electric tool manufacturers and secured repair contracts from several tool concerns. This assured a constant flow of small motor repairs running through the shop.

When the high cycle portable tool came into general use in the automotive industry, facilities were expanded to take care of this highly specialized work, and the constant flow of small motors, allows the work to be organized on a production basis. The shop is divided into two sections. One is devoted to winding high cycle stators and small armatures. The other takes care of the larger motors, special jobs such as welding transformers, solenoid coils, controller repairs and general motor shop work.

A stock of frequently required sizes of high cycle stators and armatures is maintained ready wound. This not only makes possible quick action on repairs but helps smooth out the run of work through the shop. High cycle stators are also sold directly to the maintenance departments of factories on an exchange basis, taking in the customers burned out stators, if they are undamaged mechanically, and rewinding them for stock. The shop employs forty mechanics or more.

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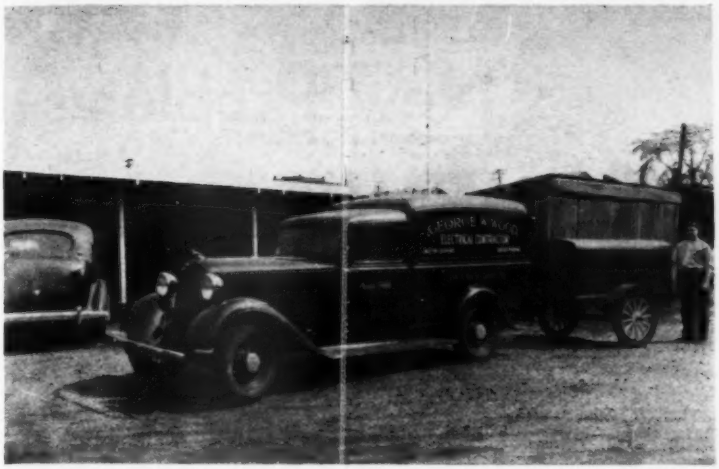
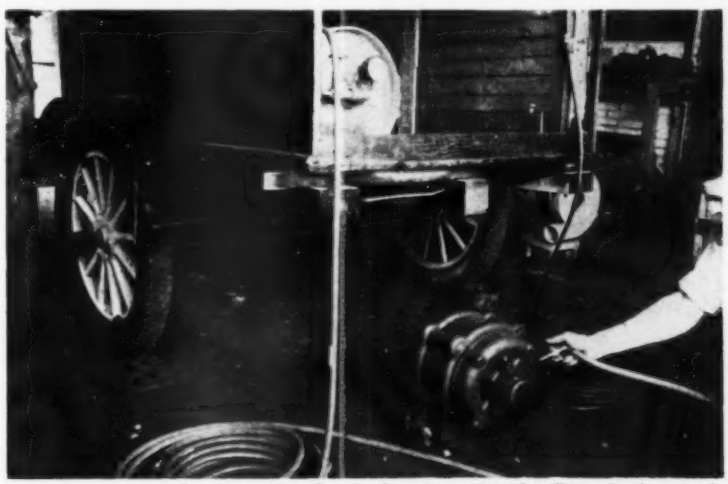
Taking the Air

This Shop Uses a Trailer Outfit for a Quick On-The-Job Service of Air Pressure Motor Cleaning



TRUCKS HAUL *this compressor-trailer to the customer's plant, where it is unhooked and put to work wherever a dust-blanketed motor needs a thorough blowing out. George W. Wood, industrial contractor stands at the right.*

TRAILER BODY—*Houses a 30-gal. steel tank, an air compressor, a ½ h.p. motor, with automatic pressure switch to compress air to 75 lbs. The enclosure is 31-in. high, 45 in. wide and 71 in. long, with space for tools and supplies.*



HOME MADE *of auto parts, with 3 in. by 5 in. main side sills, and 8-ft. 4 in. by 4 in. center sill that also forms the tongue by which the outfit is hitched to a service truck. This outfit is equipped with a 50 ft. No. 12 super-service cord for the motor, and a 50 ft., ¼ in. air hose, and cleaning nozzle.*

INDUSTRIAL plants in and around Chester, Pa., need have no trouble from dust-blanketed motors, even though some units are isolated from compressed air connections. George W. Wood, electrical contractor of that city, comes into the plant with a trailer-type outfit that houses an air compressor and storage tank.

With sawdust, filings, lints, dusts and other gatherings, common to so many industries, the removing of such foreign matter from motors requires regular attention. And satisfactory results depend on plenty of air pressure in large volume. This outfit therefore, is set at 75 lbs. pressure, has a large compressor tank and is capable of getting rid of heavily incrusted materials.

So motor cleaning jobs can be done at the plant thoroughly and quickly, without disturbing regular plant operations, because the trailer may be easily rolled along factory aisles to where its 50-ft. air hose will reach the motor. And recently a plant with 30 motors in operation signed up for periodic cleaning by this outfit because the rapid accumulation of lint and dust had seriously affected the motor temperatures and showed a heavy outage record.

Mr. Wood built this mobile outfit at a cost of about $100 which permits its profitable operation in small plants for $2 per hour, plus the operator's time. It is towed to a job by the company's regular trucks, then is unhitched and rolled wherever needed. There is space within the trailer for such tools and supplies as may be needed for regular maintenance routine. This outfit may be dropped off at a plant and picked up whenever the truck comes back from other deliveries.

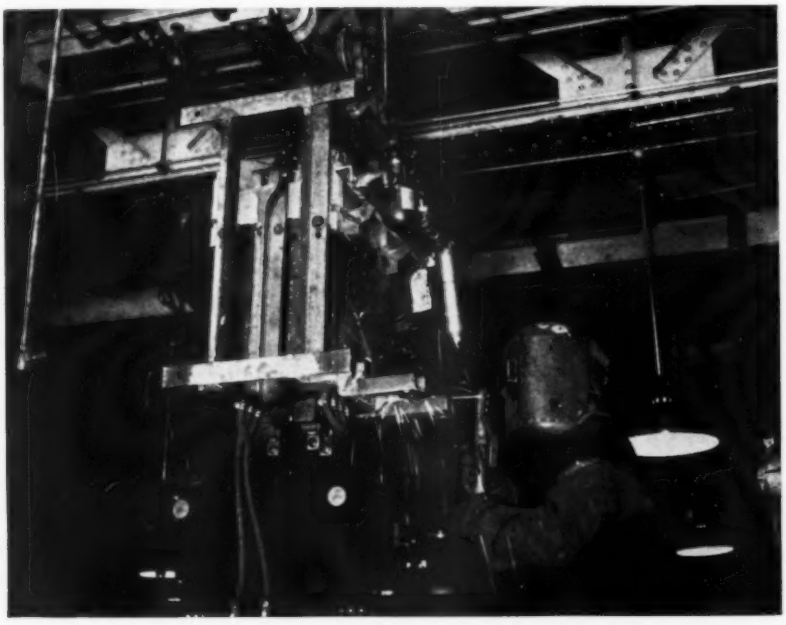
New Problems New Technique

ASSEMBLY—*Making up brackets for the high cycle ducts—and well made.*

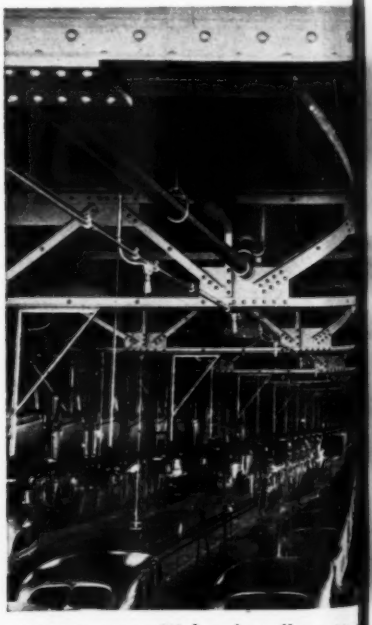
WELDED brackets and hangers at the new General Motors assembly plant in Linden, New Jersey, forecast a new trend in installing exposed wiring in industrial plants. Frequent change in the electrical layout is essential in the automotive industry. Wiring and equipment must be installed, by methods which allow quick removal and alteration, without weakening the building structure. Thus drilling steel columns or trusses is no longer acceptable.

Six arc welding machines solved the problem for Fishback and Moore, electrical contractors, on this project. A power operated shearing and punching machine and bench-mounted bar benders cut and formed the thousands of clamps and hangers. The welding crews put them together and arc welded them to the building structure.

The overhead lighting and power conduits are supported from messenger cables, fastened to the structure with beam clamps. Special clamps and hang-



BUILD-UP—*This transformer bracket will not give way at the joints. It's welded to stay from now on.*



WELDED FAST—*High cycle trolley supp are welded to the steel trusses.*

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Welding and Power Cutting Combine for Speed and Economy on this Big Job

ers were made for the feeder lines, pull boxes, lighting transformers and other equipment.

Where switches or controllers were mounted on columns, hanger irons were made up and bolted to the equipment. It was then hung in place and the hangers arc welded to the column. This gave a strong, rigid support without drilling or cutting the steel work. When the equipment must be moved, it is taken off the hanger and the hanger cut away at the weld with a cold chisel and the rough spot ground smooth, flush with the column.

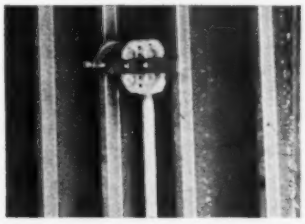
For Trolleys and Buses

Hundreds of supporting brackets for the high cycle trolleys, which supply power to the portable tools used in the production line, were made up of angle iron, welded on a standard template and punched ready to receive the trolley duct. These frames were then welded to the steel trusses above and the duct installed. The same methods were used to install the bus work, feeding the welders.

Special hangers for the production line, welding transformer, controller mounting frames and other fabricated parts were built up on the job by the welding crew. The contractor reports that this results in a much improved mechanical job over former drilling and bolting methods; furthermore it makes possible a material reduction in the cost of fabrication and installing hangers on large jobs.

Here then is an example of modern methods adapted to industrial installation trends.

CUTTING BARS—*On this power machine, bracket members are cut off with one bite.*



READY TO SPOT—*This outlet box is clamped in position ready for the welder.*

NO DRILLING—*This controller is welded to this column at four different points.*

TWISTER—*Clamps and rod hangers are bent in a hurry on this handy bender.*

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MERCURY-MAZDA—*Power company office at Johnstown, Pa., combining 400 and 250-w. mercury lamps with 300, 200 and 100-w. Mazdas, giving an average of 35 to 40 foot candles of illumination.*

Combination Lighting Goes MODERN

An interesting installation that combines mercury and Mazda units in troughs and on columns

by Frank R. Knowles

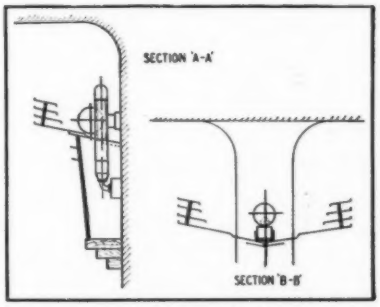
Director Commercial Engineering Dept. Pennsylvania Electric Co., Johnstown, Pa.

THE lighting of the public space of our office presents another progressive step in architectual lighting for the modern business interior. For the first time, to the author's knowledge, the 250-watt and 400-watt mercury lamps have been utilized in a commercial interior in other than conventional indirect luminaires.

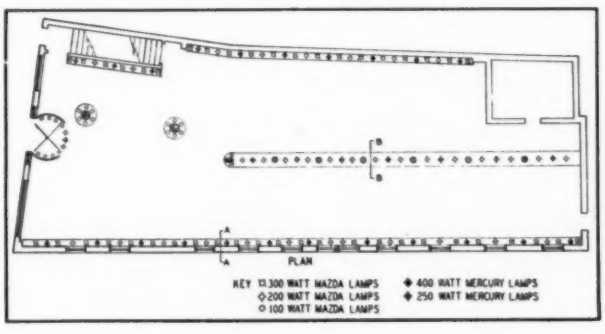
The twenty-two 400-watt and nine 250-watt mercury lamps are being used with forty-four 300-watt, thirty-nine 200-watt and twenty 100-watt lamps to provide an illumination of 35-40 foot-candles average in service. The back section of the office where the billing, tabulating and other office work is done is provided with a somewhat higher illumination than the front section where the seeing tasks are not as severe.

The ceiling of the office is finished in a flat white, while the walls are light cream in color. The walls also have a matte finish. The color quality of the lighting, produced by approximately equal amounts of mercury and incandescent light, creates a cool color tone on the walls and blends well with daylight.

The comments of local merchants, employees and visitors have indicated strong eye appeal. This method of lighting also is particularly suitable for securing higher illuminations of shadowless light where ceilings are relatively low.



HOW IT WAS DONE—*Details of layout and method of installation used in the Johnstown office.*



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SELLING AMMUNITION—*Portland inspectors carry around photographs like this. It was the rear of a distributing center in a local dance hall found upon re-inspection. This meant a nice wiring job for some contractor.*

Inspectors LIKE SELLING

ANY man who still doubts that the inspector is a potential salesman for the contractor might ponder this bit of experience. Fred Symons, deputy city electrical inspector of Portland, Ore., in six months' time has cleared up 299 fire marshall's complaints, along with his regular inspection duties on new work. The 200 represented about $4,000 of business for the local electrical contractors. The jobs ranged from a few dollars to one of almost $2,000. Nearly 80 per cent of the registered contractors of the city were in on the work to some extent.

Symons and his associates can handle about 30 to 50 reinspection cases each, per month, under present conditions and get them finally cleared. But now, having a taste of the fun of selling and the benefits that come out of it, some of them wish to do more of it. They say they could if the contractors would cooperate more closely in certain respects. Symons suggests the following ways to speed the inspector's work and help get more time for reinspection, so he can do more selling.

1 Contractors should take out a permit as soon as the owner has designated him to do the work. Then the inspector will not have to hunt the contractor up through the owner, to find out if he has started the work or not. Some even finish the job and put off taking out the permit until some later date. More chasing around.

2 After taking out the permit, make the corrections with the least possible delay, not only to avoid antagonizing the customer, but to save inspection callbacks. In a word, get the work done and release everybody.

3 Once started, complete the job so that each and every correction in the notice is properly taken care of. A single omission keeps the whole thing up in the air, makes another trip for the contractor and the inspector.

4 Send competent and dependable workmen to the job who know the code. They will be sure to complete all the requirements of the notice in compliance with the code. If an electrician is careless or ignorant of the requirements and makes mistakes or omissions, he is liable to delay or make more mistakes, even though he must go back and remedy them on his own.

"Finally", says Mr. Symons, "a large percentage of deputy electrical inspectors in almost every city have the ambition to do creative work. This reinspection work is creative. In addition to allaying fire hazard, which in itself is highly worthwhile, the inspector can come back to the office and say:

"Well, I sold a $150 wiring job today. What did you do Bill?"

"We get no end of inspiration out of it. And we believe that more cooperation can be expected on the part of the contractors when they realize that we are out 'to get the business', even if it is for the fun of it."

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LIGHTING STUDY — *Modern illumination planned for comfortable dining is here reflected in the south's largest mirror.*

Completely Electrified Establishment Presents Latest Example of Heavy-Duty Wiring Needed for Commercial Heating Applications

Ideas From

DOWN in the T.V.A. belt at Knoxville, Tenn., the latest cafeteria unit in the S & W chain has just been completed. Held to be the model of this company's group of southern eating places, it was planned for both modernistic beauty and efficiency. Contractors will be interested in this new electrified cafeteria, because the business district of every city has one or more eating places and they are gradually changing over to better methods of selling their product. This means new electrical applications for cooking, baking, food warming and other refinements, such as lighting and communications.

When this latest S & W unit was decided upon, the management called in experts to plan it. For it was to be a model job. Kurt Versen, a member of the commission planning the lighting for the New York World's Fair, was in charge of illumination design. The company's equipment manager for all plants worked with kitchen experts to obtain the correct electrically heated ovens, ranges and other apparatus.

R. MITCHELL MURPHY, *Knoxville contractor whose company installed the S & W wiring.*

Finally, when the plant was all laid out, R. Mitchell Murphy, of the Murphy Electric Company, had a heavy-duty job of wiring to install. One of the largest cafeteria services in the south was required. This service consisted of three 5-in. conduits, each containing three 1,000,000 c.m. cables and one 4/0 cable. Air conditioning motors, electrical cooking, roasting, baking and electrically heated auxiliary devices, plus the wide application of motorized labor-saving equipment, made of this a very diversified job.

Signaling and communications facilities were also planned to save steps for workers and to avoid unnecessary shouting of orders between departments. There are five loud speakers

FUMELESS WORKSHOP—*The air conditioned kitchen (right) where stoves, ovens and soup kettles are all operated electrically.*

COFFEE SERVICE *is important to southern patrons. Batteries of electrically heated urns (left) do the job.*

LOAD CENTER—*Efficient operations in compact areas required locating specially designed circuit breaker panels near their equipment (lower right).*

Cafeteria Check List of Electrical Applications

KITCHEN APPLIANCES:
- Ranges
- Baking Ovens
- Frying Kettles
- Griddles
- Stock Kettles

COUNTER APPLIANCES:
- Coffee Urns
- Bread Warmers
- Plate Warmers
- Cup and Saucer Warmers
- Food Tray Warmers
- Waffle Irons
- Toasters
- Hot Plates
- Egg Boilers

SIGNALS AND COMMUNICATION:
- Paging and Announcing Systems
- Public Telephones
- Speaking Tube Signals
- Film Projection Equipment
- Inter-Office Signals

MOTORIZED EQUIPMENT:
- Air Conditioning
- Elevator
- Dumb Waiters
- Dish Conveyors
- Hood Ventilators
- Dishwashers
- Burnishers
- Peelers
- Grinders
- Slicers
- Mixers
- Water Softeners
- Pumps
- Heating Plant
- Refrigeration

ILLUMINATION:
- Exterior Floodlighting
- Marquise Lighting
- Outdoor Signs
- Indoor Direction Signs
- General Interior Illumination
- Emergency "Exit" Lights

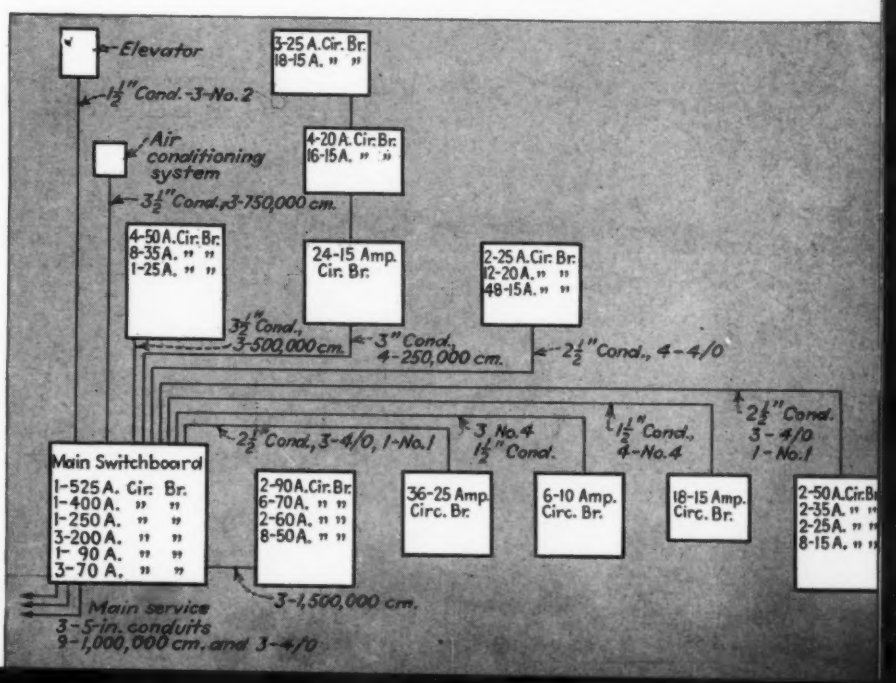
ELECTRICAL NETWORK—*What it took to supply adequate circuits for the needs of this completely electrified cafeteria.*

m Cafeteria

at important stations, connected to microphones at dumbwaiters and serving counters. In addition there are speaking tubes and signaling circuits for five other convenient locations.

There are private dining rooms and a banquet hall, for which auxiliary electrical equipment was provided. In one special room, the kiddies are entertained with talking movies. Outside the cafeteria, there are floodlights to illuminate the colored tile front, while tubular lamps, concealed in the marquise, provide a pleasing effect to attract passersby.

Some of the modern electrical applications for this cafeteria have been listed. These may serve as a guide for contractors who are working on modernization ideas with cafeteria owners and architects in their communities.



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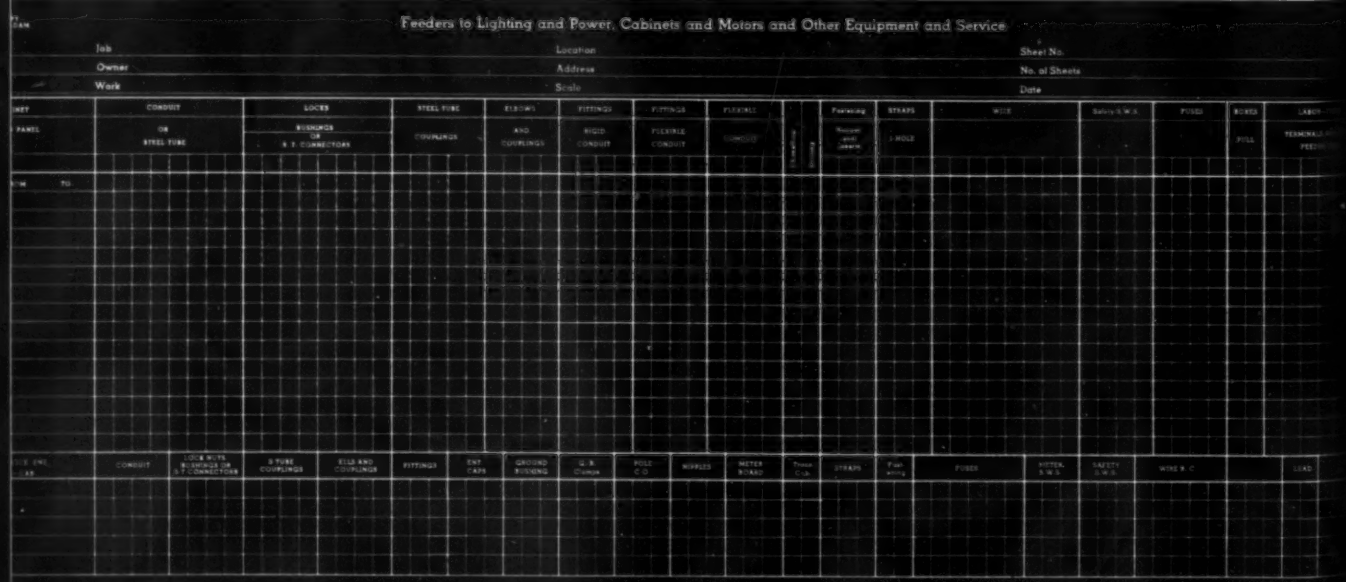
(ABOVE) *Branch circuit work taken off on this form lends itself to the application of labor units in the NECA Manual.*

Take-Offs that Remain Readable

TAKE-OFF sheets often hound the careless estimator when he attempts to decipher crude notations and symbols, after they have grown "cold." These troubles are largely eliminated by the use of estimating forms recently developed by G. V. Dameron, electrical contractor, of Kansas City, Mo. The most commonly used types and sizes of construction materials are already set up for the estimator, and are arranged in logical order on two forms—one for the branch circuit take-off, the other for service, feeders and equipment. They are printed brown on 8-in. by 19-in. sheets, to fold slightly less than letter size, for easy filing with other papers on the case.

These forms were submitted by Mr. Dameron to the Kansas City Chapter of NECA, and were adopted to facilitate the use of the NECA Manual of Labor Units. The take-off forms were considered especially well adapted to the Manual system of pricing labor costs. After an estimate has been completed from these forms, the estimator has a clean-cut record of the job, which saves considerable time if changes or revisions are called for at a later date.

(BELOW) *Many odds and ends of material and labor in the service and feeder estimate, as provided for on this form, are usually "lumped" or overlooked by the estimator.*



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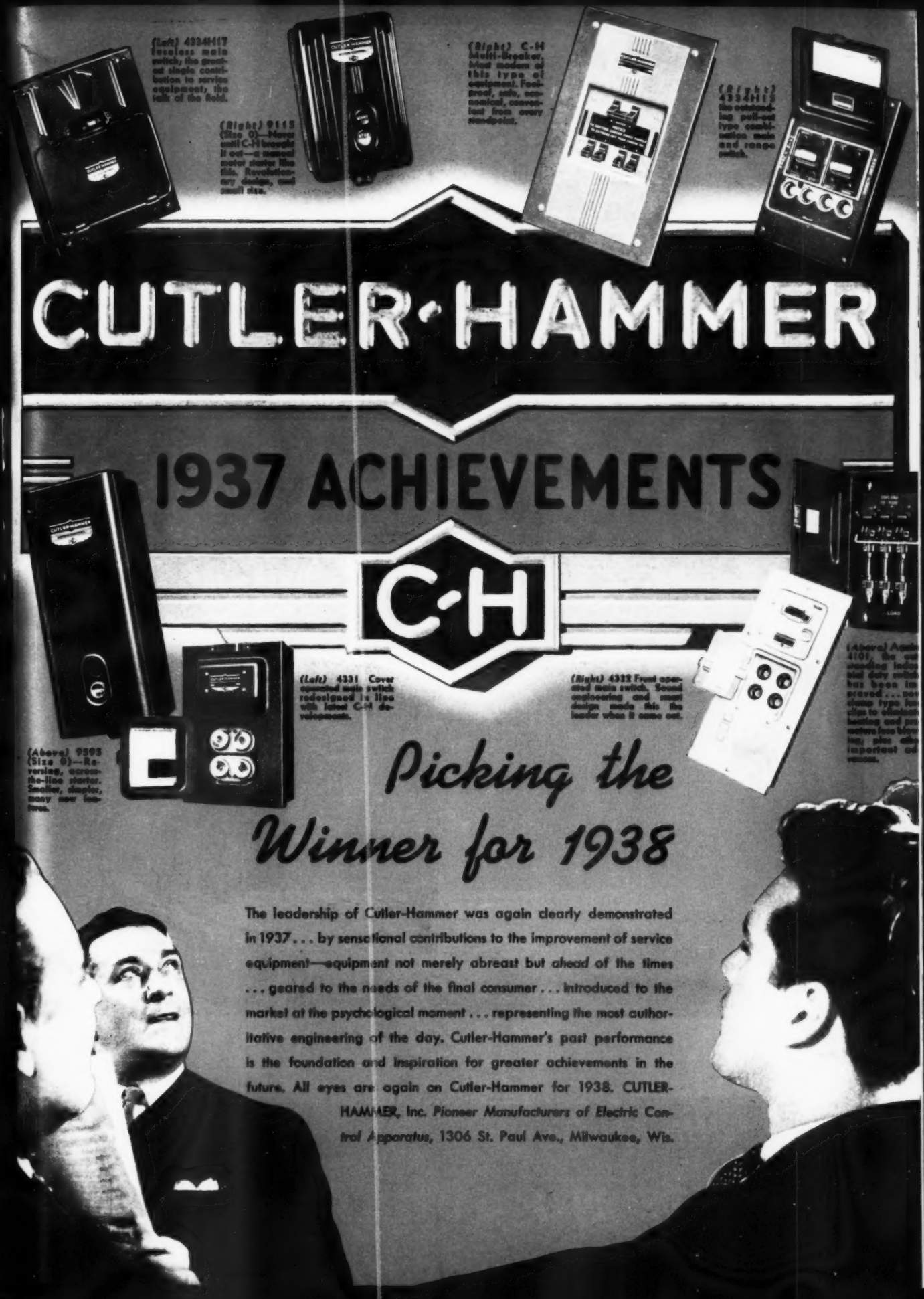
(Left) 4334H17 faceless main switch; the greatest single contribution to service equipment, the talk of the field.
(Right) 9115 (Size 0)—Never until C-H brought it out—a manual motor starter like this. Revolutionary design, and small size.
(Right) C-H Multi-Breaker. Most modern of this type of equipment. Foolproof, safe, economical, convenient from every standpoint.
(Right) 4334H15 the extraordinary pull-out type combination main and range switch.
CUTLER-HAMMER
1937 ACHIEVEMENTS
C-H
(Left) 4331 Cover operated main switch redesigned in line with latest C-H developments.
(Right) 4332 Front operated main switch. Sound engineering and smart design made this the leader when it came out.
(Above) 9503 (Size 0)—Reversing, across-the-line starter. Smaller, simpler, many new features.
(Above) Auxi 4101, the cor reading indic and duty switch has been im proved . . . nov clamp type ins clip to eliminate heating and pro nature loss bloc ing, plus othe important ad vances.
Picking the Winner for 1938
The leadership of Cutler-Hammer was again clearly demonstrated in 1937 . . . by sensational contributions to the improvement of service equipment—equipment not merely abreast but ahead of the times . . . geared to the needs of the final consumer . . . introduced to the market at the psychological moment . . . representing the most authoritative engineering of the day. Cutler-Hammer's past performance is the foundation and inspiration for greater achievements in the future. All eyes are again on Cutler-Hammer for 1938. CUTLER-HAMMER, Inc. Pioneer Manufacturers of Electric Control Apparatus, 1306 St. Paul Ave., Milwaukee, Wis.

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...'Tis and 'T

THERE IS NO SUBSTITUTE FOR F

UMI

hint...

UNT MATHILDA, who used to mark all er pies, "TM," regardless of their lling, explaining that either "'tis ince or 'taint mince," reminds us of me people in the electrical business.

Equally inconsistent are those who efer to just any wire that happens have some flame-retarding, mois-re-resisting qualities as "Safecote." his is a whimsicality to say the least. s Aunt Mathilda would say—"'taint" - not by a jugful.

"Safecote" is a trademark used by leading wire manufacturers who make Safecote Electrical Conductors to definite Performance Specifications under the supervision of the Safecote Laboratories.

Flame-retarding, moisture-resisting, fishable—are only some of several Safecote "musts." When you specify "Safecote" wire, make sure that you get genuine Safecote. It is labelled with this trademark.

ELECTRICAL

FLAME RETARDING MOISTURE RESISTING
SAFECOTE
FISHABLE — SLICK FINISH
REG. U.S. PAT. OFF.

CONDUCTORS

U. S. LETTERS PATENT NUMBERS:

1,635,829	1,772,436	1,765,000
1,798,486	1,410,790	1,536,549

OTHER PATENTS PENDING

INSIST UPON GENUINE SAFECOTE FOR YOUR PROTECTION

R FECOTE

SAFECOTE LABORATORIES ARE AT YOUR DISPOSAL
SAFECOTE PERFORMANCE SPECIFICATIONS UPON REQUEST
GEORGE C. RICHARDS, LICENSOR'S AGENT
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THE BEST WIRE FOR NEW AND OLD HOUSES

HAZARD WIRES and CABLES

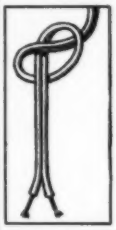
HAZARD FIREKROME SAFECOTE BUILDING WIRES

1 Performite "super-aging" rubber insulation is tougher, stronger, and has greater life.

2 Hazard Standard 30% insulation is an excellent wire used in many outstanding buildings.

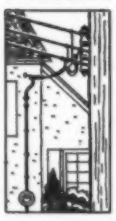
3 Hazacode (National Electrical Code Standard) is thoroughly reliable.

HAZARD FIG. 8 LAMP CORD



A low cost all-rubber cord with single rubber jacket. A knife nick at the end, and the conductors may be easily separated, leaving full insulation on each.

HAZARD SERVICE CABLES

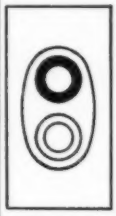


1 Hazard Drop Cable, Type SD—pole to house.

2 Service Entrance Cable, Style ABN with steel tape armor, or Style UBN without steel.

3 Underground Entrance Cable with interlocking galvanized steel armor, or Armortite non-metallic armored cable.

HAZARD PERMEX LAMP CORD



This rubber sheathed lamp cord has two separately insulated conductors with a tough rubber jacket surrounding them.

HAZARD ARMORED CABLE

Type AC. A new cable with the handy pull-string. The conductors are wrapped in chemically treated, flame-retardant, moisture-proof paper. The bushing slips between paper sheath and steel armor.

HAZARD CNX (Trial Installation Cable)

This covered neutral cable is designed for use in houses, buildings of frame construction and all types of farm buildings, including barns, garages, stables, etc.

HAZARD INSULATED WIRE WORKS

Division of The Okonite Company

WORKS: WILKES-BARRE, PA.

Sales Offices:

New York Chicago Philadelphia Pittsburgh Buffalo Boston Detroit

Atlanta Seattle Dallas San Francisco Los Angeles Washington

WHAT IS AIR CONDITIONING

—A Close-up of the Market

AIR conditioning, right now, is the most popular contribution that science is making to human comfort. Everybody is talking about it. Some $75,000,000 was spent in 1937 for air conditioning installations. This public interest is opening up a vast new market, that is more important to the electrical contractor than he himself appreciates.

Many electrical contractors are already busy in this new industry. Some are wiring installations sold by other air conditioning distributors. Some are themselves installing complete systems of air conditioning. And many others, not yet in air conditioning work, will soon be discovering that there is a vast volume of simple "air conditioning" business ready at hand.

Air conditioning works through the control of the temperature, the moisture content and the cleanliness of air in a room or building. But air conditioning systems are to a large degree the outgrowth of ventilation and with public attention focused upon man-made weather, a great desire is being created for clean fresh air. In fact, the object now largest in everybody's mind is relief from summer heat.

This opens the way to a vast new business that is really only an approach to true air conditioning. It will be a business of making people—in homes offices, stores and other buildings—more comfortable. It will sell the use of ventilating and cooling devices and gradually will build up the broader market for complete temperature and moisture control.

This wide range of applications means that indoor weather gives opportunities to all classes of contractors. Some have set up departments for complete air conditioning. Others do a sales job in room air conditioners or coolers. All contractors are in position to merchandise and install ventilation and air cleaning devices, attic cooling systems, and other available appliances.

Home Market

There are about 25,000,000 non-farm families, of which 9,000,000 own their homes. You know how many live in your town.

Here is a field for air improvement in which little has been done so far. All of these people have already enjoyed the comforts of man-made weather in shops, theaters and offices. They want to have some of these comforts in their own daily living. But less than 11 per cent of the homes and apartments enjoy any of the phases of air conditioning.

So the home market is ripe for development, in one or more of these phases of indoor comfort—

a. Kitchen ventilation and fume removal
b. Room ventilation, air cleaning and noise elimination
c. Summer cooling with attic systems
d. Room cooling and conditioning units
e. Winter humidification
f. Summer conditioning
g. Complete year-round air conditioning

INDOOR COMFORT *reaches all phases of modern living. Sell it first to the "tops", to help you sell others.*

UMI

Store Market–

Commercial establishments are obviously the most responsive to air conditioning. Yet only 21 per cent have been air conditioned in some manner. Here are some of the best prospects in this market—

	In the Country	How Many In Your Town?
Restaurants, Cafes, Grills	251,084	——
Women's Specialty Shops	87,000	——
Men's Apparel Shops	27,000	——
Beauty Parlors	61,176	——
Barber Shops	121,057	——
Drug Stores	58,000	——
Syndicate Stores	99,583	——
Shoe Stores	19,000	——
Food Stores	500,000	——
Jewelry Stores	14,313	——
Candy and Confectionery Stores	54,243	——

In addition, the commercial field includes—about 15,000 moving picture theaters, 7,500 funeral homes, 3,000 dance halls, 8,700 hotels of 50 rooms or larger, 3,500 large department stores, 4,500 clubs. Then there are bakeries, bowling alleys, florists, fur shops, photography studios, art and gift shops and so on.

List down how many of these best prospects there are in your town. There is your waiting market.

Office Market–

Modern business men appreciate that clean and comfortable air helps in an office. Lower floor rooms are most troubled with dirt and noise. All rooms need ventilation to replace bad air. Many need temperature and humidity control.

In this field are these important prospects—

	In the Country	How Many In Your Town?
Doctors' Offices	185,000	——
Dentists' Offices	65,000	——
Banks	14,000	——
General Office Buildings	10,700	——

WHAT YOU HAVE TO SELL

TO HOMES—
Comfortable temperatures. Plenty of clean fresh air. Correct humidity. Freedom of cooking and smoking odors. Restful sleep, free of street noises.

TO STORES—
Shopping comfort. Greater sales volume. Year round patronage. Cleaner merchandise and fixtures.

TO OFFICES—
Increased efficiency and comfort. Reduced employee absence. Freedom from odor and smoke-laden air.

TO INSTITUTIONS—
Healthful, comfortable temperatures. Less noise and dirt from busy streets. Lowered cleaning and painting costs.

TO FACTORIES—
Better products, less spoilage, speeded processes. Freedom from impurities, corrosive fumes and vapors. Increased effectiveness of workers.

Some office buildings are now being completely air conditioned. But the greatest market for electrical contractors lies in the individual suites in occupied buildings, where they can be interested in one or more phases of air improvement. Here is a broad field for ventilating units, humidifiers, air cleaning and noise preventive appliances, room conditioners and complete unitary air conditioning systems.

Institutional Market–

Hospitals, schools, churches, libraries, community centers, city and county buildings and similar institutions offer all the air handling problems of the office, the store and in some cases those of the factory. Many of them do not have adequate built-in ventilating systems, and are not likely to ever be completely modernized. Here then are prospects for units or area treatment.

Laboratories and operating rooms need fumes and odors expelled and replaced with fresh air. Local cooking is often done in spaces not properly ventilated. Offices and waiting rooms are uncomfortable in hot weather. Children in schools and patients of hospitals are subjected to street dusts, pollen, disturbing noises, or stuffy air, because of improper facilities. All kinds of equipment for improving air conditions may be applied.

Factory Market–

The industrial market involves two elements—worker comfort and processes. Plant and office workers are more efficient when given fresh bracing air, cleaned, tempered and correctly circulated. Processes are dependent upon conditioned air to make materials more suitable for working, to assure correct chemical action and to control the amount of moisture in the product. Other factors are protection of materials, parts and machinery from rust, corrosive fumes, gases, steam and vapors, and the prevention of static electricity.

In every town there are many common processes that need air conditioning—

	How Many In Your Town?
Baking	——
Brewing	——
Candy Making	——
Laundries	——
Meat Handling and Storage	——
Milk Processing	——
Painting and Lacquering	——
Photo Engraving	——

CUSTOMER APPRECIATION *for shopping comfort makes commercial leaders quick to buy man-made weather.*

UMI

The electrical contractor now serving industries has a big market here. Beginning with ventilation and fume or dust removal in the plant, clean air and quiet conditions for the office, he will work forward to the larger more technical industrial air conditioning work.

HOW TO ORGANIZE TO SELL THIS MARKET

Four basic steps lead the contractor into air conditioning work—

1. Sale and installation of ventilation, air circulation, filters and humidifiers.
2. Sale and application of fixed or portable room units. This involves estimating refrigeration, room conditions and exposures.
3. Sale of small unitary air conditioning systems and various types of residence conditioning units. This can be started in cooperation with a reliable distributor, who is responsible for surveys, estimates and installation details.
4. Then, when experience has been acquired in this manner, the necessary sales, engineering and installation personnel may be set up for a complete department qualified to handle larger air conditioning installations.

Select Your Field—

The most important step in the approach to air conditioning, is to select the type of customers that you are ready to serve—

Step 1. If you are doing only new residence wiring and have not engaged in appliance sales, limit your efforts to ventilating fans for the kitchen, attic and recreation room.

Step 2. If you have a good residence wiring and service, plus suitable merchandise display space, take on portable window ventilators, humidifiers and room conditioners.

Step 3. If you have a knowledge of heating, the field of modern winter conditioning for new and old homes is wide open. These systems also include summer conditioning, as a further field, when your sales organization is able to handle it.

Step 4. If you do a general commercial business, sell your office and store customers the various portable appliances to suit their needs.

Step 5. If you are engaged in factory wiring and service work, display air circulation and ventilation equipment. Train your sales and service men in the application of ventilation and air conditioning to industrial processes.

Step 6. Follow Steps 3, 4 and 5 with the sale of small complete units or systems for commercial and industrial buildings.

Step 7. Finally comes the so-called tailored year round system. This may be for a store, an entire building or for an industrial process.

KICHEN COMFORT *is available at reasonable cost for millions of homes through window ventilation units.*

MARKETS ABOUND. *Improved indoor air is needed wherever people work, play or rest. Homes are hardly touched. Business is alert to profit. Industry seeks better process control.*

Prepare to Sell—

Getting into this business gradually in this way is just like starting any new business—you must learn to promote it, dig up prospects, then interest and sell them. But the operation of an air conditioning department must be built upon a background of ventilation and air circulation, heating, humidity control and refrigeration. Here are the initial requirements—

1. Select the type and line of equipment which you can best sell.

UMI

MERCHANTS *who see the value of good air in their stores are ready to be sold these benefits for their homes.*

2. Prepare a list of local families, merchants and manufacturers offering best prospects for sale.
3. Set up a department head who will be responsible for the full operation of your air business.
4. Secure an experienced air conditioning engineer trained, in the line you are to sell, and establish him with facilities for handling plans and serving customers.
5. Provide an experienced salesman (a salesmen) and unless he knows your line, send him to the factory for instruction.
6. Prepare plans for proper advertising to support your salesman, by interesting home owners, merchants, manufacturers, builders and architects, before interviews.
7. Get in adequate equipment to provide for proper displays in windows and show rooms.
8. Organize your air conditioning activity, so that all parts are working in balance.

Engineering Resources

It is generally considered easier to acquire the necessary air conditioning engineering and installation personnel than to teach a contracting organization how to sell this specialty. Your engineering resources will develop naturally in this way—

1. Ventilating fans, room conditioners and simple residential equipment will become familiar to properly trained salesmen, so that quotations may be made without special assistance.

2. Small air conditioning systems of the unitary type may require only a sales-engineer to make rough preliminary surveys at the premises. These can be submitted to the manufacturer for verification and suggestions.

3. For selling large involved air conditioning systems, the sales staff must have the assistance of thoroughly trained engineers. Before any sales work can become fruitful the engineering staff must make surveys, design suitable layouts and prepare estimates, so proposals may be submitted.

4. In some cases a cooperative arrangement is desirable with sub-contractors, engaged in heating, sheet metal work and general contracting. This will provide resources for installation work and enable you to offer a complete service.

Where to Get Experience—

There are plenty of places to gather experience and secure help in setting yourself up in air conditioning, on whatever scale you desire to operate. Every prominent manufacturer of equipment provides sales data to guide his dealers. Your local power company will gladly advise you in setting up a sales program. In some cities also an air conditioning bureau offers valuable practical assistance. Therefore, draw on—

1. Training courses offered by manufacturers of air conditioning equipment.
2. Manufacturers application manuals.
3. Salesmen and engineers of air conditioning distributors.
4. Power company air conditioning experts.
5. Advice from contractors in other cities, successful in this field.
6. Text books on heating, ventilation, refrigeration and air conditioning.
7. Correspondence or personal training courses in reliable trade schools.
8. Local meetings of air conditioning councils or bureaus.

DINING AT EASE *in man-made weather, millions of people in all walks of life are being converted daily. Your job is to show them what each one needs.*

UMI

WHICH PROSPECTS FIRST?

—FOR WHAT?

Wherever people work, shop, sleep or play under some form of air or weather discomfort—there you have a prospect. To begin, select those who look **easiest to sell.**

One large company sends its salesmen first to the bell cows in each field. They start at the top. Any town of 100,000 population usually has 25 people who may be classed as leaders. People with money and prestige in the community, the most successful merchants, the most progressive manufacturers, should be sold first.

New Homes offer many possibilities for built-in ventilation equipment, attic cooling systems, winter conditioning systems, that combine partial summer conditioning, and for complete year-round conditioning. One large company classifies the $5000 home as the place where winter air conditioning should begin. Homes costing $7500 and up are considered prospects for year round conditioning.

Obviously the best prospects are those where your contact is already established with the architect, builder and the future owner. Here your personal sales efforts and suggestions are most apt to bring results.

Old Homes represent a market that is practically untouched. The greatest need is for sleeping comfort, which may involve anything from attic cooling systems to room coolers. Kitchen and game room ventilators, bedroom window ventilators and humidifiers all offer a large future volume in home application.

Where the existing heating plant is obsolete, a combination of winter and summer conditioning may be introduced. About 42 per cent of the existing homes still use stoves for heating, and 31 per cent use central warm air systems.

Stores and Restaurants right now are the biggest and most active market. Clean, comfortable, circulated air is no longer considered a luxury. It is in demand for convincing business reasons. Merchants want increased prestige and profits. Air conditioning attracts new customers, increases efficiency of employees and reduces soiled merchandise.

The best commercial prospects judged by the number of present air conditioning installations are——

1. Restaurants
2. Theatres
3. Women's Shops
4. Men's Shops
5. Funeral Homes
6. Beauty Parlors
7. Barber Shops
8. Department Stores
9. Food Stores
10. Dance Halls
11. Night Clubs

CROWD COMFORT *in theatres has made millions of people interested and open-minded to all the phases of air conditioning.*

SUMMER BUYING *brings influences which help you sell other kinds of buildings.*

FOOD MARKETS *need air circulation, temperature control and other phases of improvement. Customers like it.*

UMI

BAKERIES *can reduce evaporation losses in dough rooms, through the automatic control of indoor atmosphere.*

MILK HANDLING *and storage requires proper air circulation and controlled cooling for raw milk and sour cream.*

Start on these stores but remember that local climate and other conditions often make other classes of stores stand out as preferred prospects. Also, in many stores, special recommendations can be made to suit individual conditions. Here are prospects for ventilation, for humidification, summer cooling and winter conditioning and for portable appliances to circulate and filter the air or to eliminate street noises.

Institutions have many areas where air comfort is needed. Look them over. Pick the older ones first and seek out neglected conditions in—

1. Hospitals
2. Court Houses
3. Recreation Centers
4. Schools
5. Libraries
6. Public Markets
7. Museums
8. Churches

The first objective is to supply fresh air to all stuffy areas. Next, provide comfort for those who work in secluded private offices. This may mean room cooling or local unitary air conditioning. In addition, there are places to humidify, clean and circulate air.

Factories range from prospects for complete air conditioning to those where only one or more phases of air conditioning are required. The need for ventilation, humidification, cooling or air filters varies according to processes, plant layout, location of office space, or other factors. It takes a survey of the plant to locate the opportunities.

During 1937 these industries led as prospects for process- air-conditioning, in 30 cities—

1. Printing
2. Publishing
3. Foods
4. Chemical
5. Drugs
6. Textiles
7. Machinery
8. Automobiles
9. Leather
10. Metals
11. Stone
12. Clay and Glass
13. Petroleum
14. Rubber

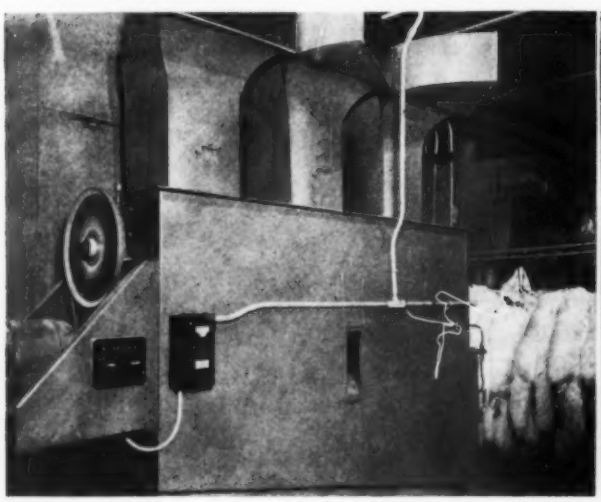
Factory prospects must be picked, however, for more than their process-control needs. Wherever fumes, steam, vapor or annoying dusts slow up worker efficiency, there recommend a corrective. The boss also needs comfortable quarters. Sell him properly and the idea usually spreads to other private offices, to the general office and to display rooms and conference rooms.

Functions and Appeals

To want comfort is natural, instinctive. Here then is Argument No. 1 in selling air conditioning. Likewise, merchants want profits and executives want efficiency. Plant management wants better products, less spoilage, speedier production. What more can we ask? There is hardly a home or a business that at least one of the eight important functions of air conditioning does not apply.

Function 1—*Fresh Air* to replace vitiated stuffy air, odors and fumes.

CONDITIONED STORAGE *for valuable raw pelts prevents trouble from moths with chilled air and humidity control.*



TEXTILES *lead in adopting conditioned air for processing as with high-speed warpers in a modern rayon mill.*

UMI

STORAGE PROBLEMS *include the effects of moisture and temperature upon materials. Here fine liquors are protected.*

LARGE OFFICES *with a battery of window units, can have ventilation and clean circulated air without noises.*

Function 2—*Clean Air* with dangerous and insanitary dust, soot, pollen and bacteria filtered out.

Function 3—*Air Motion* to give stimulating and refreshing circulation without harmful drafts.

Function 4—*Noise Elimination* to hush outdoor noises and maintain indoor quiet.

Function 5—*Cooled Air* to provide summer comfort for customers, workers, processes.

Function 6—*Dehumidified Air*, to make muggy seasons comfortable for health and production.

Function 7—*Heated Air* automatically controlling winter comfort evenly in all parts of the room.

Function 8—*Humidification*, adding moisture to dry heated air during winter season for health and processes.

To sell these eight functions these nine appeals are important—

Appeal 1. *Personal Comfort* — No one likes heat, foul odors, stuffy air, sticky weather and disturbing noises. These conditions prevail to some degree wherever people work or congregate or sleep indoors.

Appeal 2. *Convenience* — Controlled weather takes away the need for alternately opening and closing windows and doors.

Appeal 3. *Profit*—There is a profit side to customer and employee comfort. Clean air and controlled moisture and temperature save money in processing. Ventilation and air conditioning increase store trade, improve office and factory production.

Appeal 4. *Competition* — Store employees are more efficient in a healthier, more comfortable atmosphere. Old customers are pleased and held. New trade is attracted.

Appeal 5. *Prestige*—Indoor weather comfort has a publicity and advertising value. It brings prestige to the doctor, dentist, attorney and advertising agency as well as to the merchant.

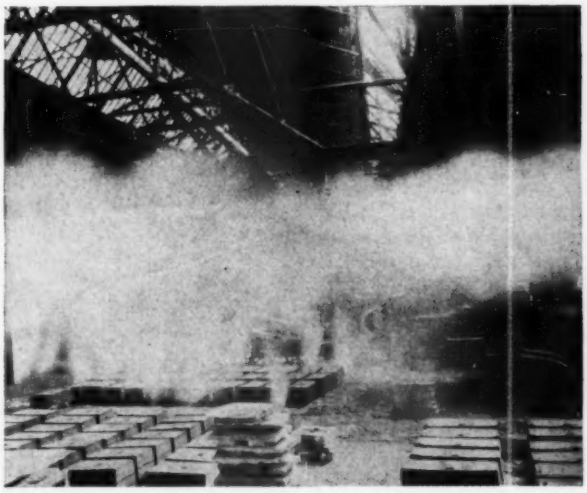
Appeal 6. *Employee Efficiency*—The common cold takes a heavy toll in absent employees during winter months. Uncomfortable, headachy clerks slow up in busy seasons, make costly errors and bring confusion to the business routine.

Appeal 7. *Executive Comfort* — A cheap investment that saves time, nerves and health of high-salaried executives and steps up their year round efficiency.

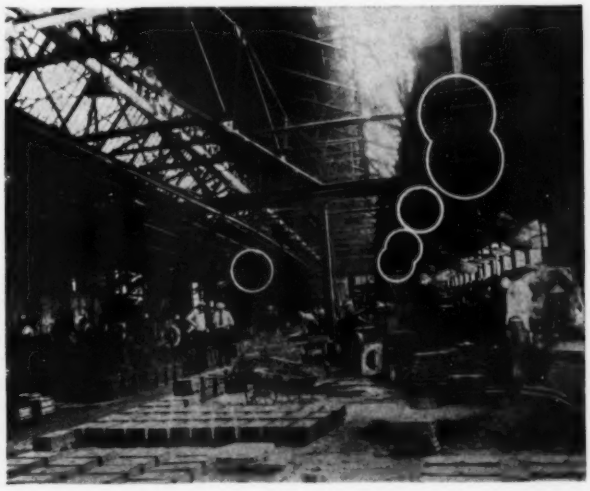
Appeal 8. *Reduced Spoilage*—Stores save money on less soiled merchandise. Comfortably conditioned fitting rooms eliminate perspiration-stained garments. Air circulation and proper temperature and humidity control removes dust and soot and saves spoilage in factory production.

Appeal 9. *Prevents Diseases* — Air has much to do with winter colds, headaches, grippe and respiratory diseases. Ventilation and air conditioning prevents the spread of common colds as well as the breathing of unhealthy dusts in homes, stores, offices, factories.

INDUSTRIAL WEATHER CONTROL *solves many problems affecting workers and production, like this foggy condition.*



AFTER CORRECTION—*Adequate heating and air circulation units now provide breathing comfort, speed production.*



UMI

HOSPITALS *and doctors' suites need weather comfort for patients, surgeons and nurses. This idea is well sold.*

LUNCH ROOMS *attract more patrons and earn more profits, too, when inexpensive cooling is provided.*

SELLING THE JOB

Everybody talks about the weather. Your job is to do something about it.

Do your hunting for this business with a double barreled gun. Work in an executive's office may fail to produce an immediate order for his business quarters, yet develop a good sale in his home. Likewise, an initial job well sold in a home or apartment may lead to a larger order for a store or factory. Here are a few rules of approach—

1. Every prospect has a specific air problem. Offer him a sensibly conceived remedy. Talk his own needs.

2. Judge your prospect beforehand as to relative importance of the basic appeals; whether employee efficiency, profit, or competition ranks first.

3. Know the approximate daily and annual operating costs involved for whatever phases of weather improvement you propose.

4. Keep thoroughly informed of every important new local installation which will aid with similar prospects.

5. Don't scare ventilation prospects away by talking "air conditioning."

Analyzing the Need

In studying the prospect's need, here are some of the questions to be answered.

1. In Homes and Apartments—
   - Owners or tenants?
   - Wealthy, moderate income or wage-earner type?
   - Location—noisy, street dirt, excessive exposure to sun, normal breezes, blocked by other structures?
   - Occupants—susceptible to pollens, dusts, colds, drafts?
   - Heating plant—obsolete or adapted for conversion to conditioning?
   - Summer conditions—favorable to room cooling, attic cooling?
   - Winter need for humidification?
2. In Offices—
   - Permanency and state of prosperity?
   - Type of business—value of comfort to clients, office staff, executives?
   - Location—noisy, stuffy, street dust, dry air, summer heat?
   - Structural—window drafts, secluded or pocketed rooms, space for equipment, extent of alterations?
3. In Stores and other Commercials—
   - Customer aspects of business?
   - Trend of competition?
   - General arrangement and location of store?
   - Conditions in offices, sales rooms, fitting rooms?
4. In Factories and Institutions—
   - Principal comfort requirements?
   - Principal processing requirements?
   - Offices, laboratories, meeting rooms?
   - Health measures?
   - Efficiency factors?
   - Waste and spoilage?

Selecting Equipment

Equipment selection is an important part of selling. For the home, step No. 1 is the kitchen ventilator. Next comes the choice between an attic ventilating system or room cooling or conditioning units. If a heating system is due for replacement, one or more rooms may be permanently year-round conditioned, others winter-conditioned or handled with portable devices.

In the apartment suite, store and factory there are ways to provide clean fresh air, circulation, humidification, even complete air conditioning in units. It can be done in steps according to the customer's financial resources. There is no need to defer the most needed comforts indefinitely. The market is ready, and volume sales will depend upon the wisdom and judgment with which equipment is selected.

Demonstrations

Air conditioning entails a combination of specialty and technical selling. To do it successfully calls for a definite technique—for example—

1. Portable appliances such as ventilators and humidifiers should be demonstrated on the premises.
2. Room units and other heavy devices must be displayed and demonstrated in your own sales rooms.
3. In cases of complete air conditioning, successful systems in operation should be visited and inspected. Let the prospect talk with satisfied users and learn.
4. Some dealer organizations furnish portable devices on a trial basis, and make a nominal service charge for their use. The percentage of rejections after trial is low.
5. A booklet of installation photographs and operating data should be presented and explained.

Recommendations for complete air conditioning prospects should include testimonials from similar businesses—

a. *Shoe store* reports a reduction in 1937 summer slump. Aided in fitting and satisfying customers.
b. *Bank* executive says working efficiency and public relations are improved. Benefits immediate. Filtered air eliminates dust and dirt.
c. *Daily Newspaper* reports over a year,

TWO GREAT MONEY SAVERS

"MERGE"

Two outstanding performers in the motor control and circuit protective fields are now combined in one compact unit. The "De-ion" Linestarter and the Nofuze Circuit Breaker are brought together in the Westinghouse Combination Linestarter.

Eliminating the fuse outage costs plus assuring dependable starter performance, the Combination Linestarter is today's most thrifty buy.

- IT SAVES IN INSTALLATION COST
- IT REDUCES OPERATING COST
- IT'S COMPACT
- AND IT'S SUPER-SAFE

Get the new booklet "4 Points to Check" before installing any starters or circuit breakers. It will save you money. Simply call your electrical wholesaler.

Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

WHAT "DE-ION" MEANS
THE OLD WAY
THE "DE-ION" WAY
In the past, arcs have been broken by "stretching". The "De-ion" quencher confines, divides and extinguishes the arc almost instantly—obviously preventing burning heat on contacts or arc barriers.
CHECK THESE 9 FEATURES
FULL SAFETY
COMPLETE MOTOR AND CIRCUIT PROTECTION
BI-METALLIC OVERLOAD PROTECTION
FRONT OPERATING HANDLE
AMPLE WIRING SPACE
UNUSUAL ACCESSIBILITY
COMPACT SIZE
ATTRACTIVE APPEARANCE
LOWER INSTALLED COST

J 20519-A

Westinghouse

"DE-ION" COMBINATION LINESTARTERS

MOTORS • LINESTARTERS • CIRCUIT BREAKERS • SAFETY SWITCHES • PUSH BUTTONS

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WINTER DRYNESS, *so damaging to furniture, offers an entering-wedge to office prospects everywhere for modern humidifier units like this.*

938 days saved among employees by reduced absences due to colds.

d. *Restaurant* increased business 25 per cent, adding $1300 to net profits, 185 per cent interest on investment.
e. *Beauty Parlor* business picked up 50 per cent during hot months last summer.
f. *Food store* reports 300 per cent increase in business plus reduction in losses from spoilage.
g. *Baking plant* says automatic control of atmosphere in dough rooms has reduced evaporation loss to a minimum.
h. *Candy manufacturer* reports cost of equipment saved many times by eliminating spoilage.
i. *Printer* says without air conditioning it would be a virtual impossibility to do color work.

Financing the Job

Having sold some phase of improved indoor weather, the final important step involves the financial arrangements. Usually the smaller equipment sold to offices, stores or factories is a cash transaction. Residential and apartment house sales are often more easily made on terms. There are many ways to make satisfactory arrangements—

1. Contracts turned over to home appliance financing organizations.
2. Assistance from financing company affiliated with equipment manufacturer.
3. Monthly billings through local power company.
4. Your own bank.
5. Handle your own paper.

Larger sales bring special considerations that may require close cooperation between customer, power company, bank and manufacturer. Liberalized financing plans are now available which permit the buyer to take advantage of the slack season in the winter and postpone time payments until the air conditioning systems brings profits.

HANDLING A TYPICAL JOB

No two air conditioning installations are exactly alike. However, similar methods are followed in handling most jobs. The equipment may be grouped—

1. Central station type—Air is conditioned at a remote point and conveyed through ducts to the desired locations of a building.
   a. For large or small buildings
   b. For industrial processes
2. Unitary types—
   a. Room conditioners or coolers for permanent installation, provide winter, summer or year round conditioning in offices, residences or commercial places.
   b. Self-contained or portable units, single or in multiple, serve residences, offices or commercial places.

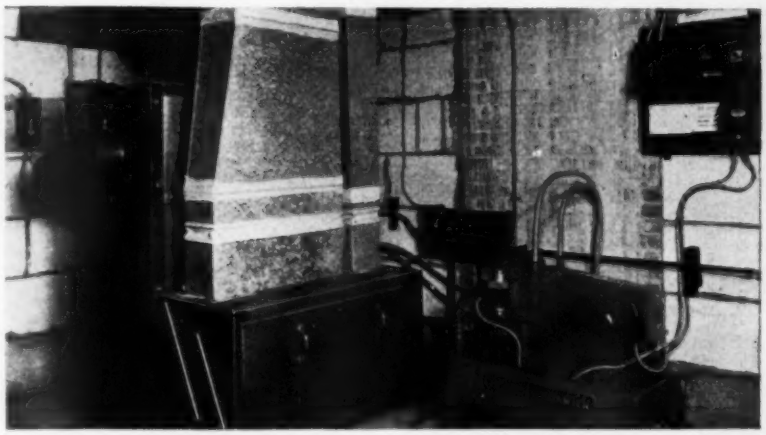
The sale of a typical unitary system for a store, averaging 10 to 15 tons of refrigeration, usually involves the following procedure—

Sales Survey—Sales are generally made direct to an owner or tenant from a dealer survey and layout. On larger systems, however, a consulting engineer is generally brought in. Many jobs of this larger type are designed and specifications are prepared before bids are obtained.

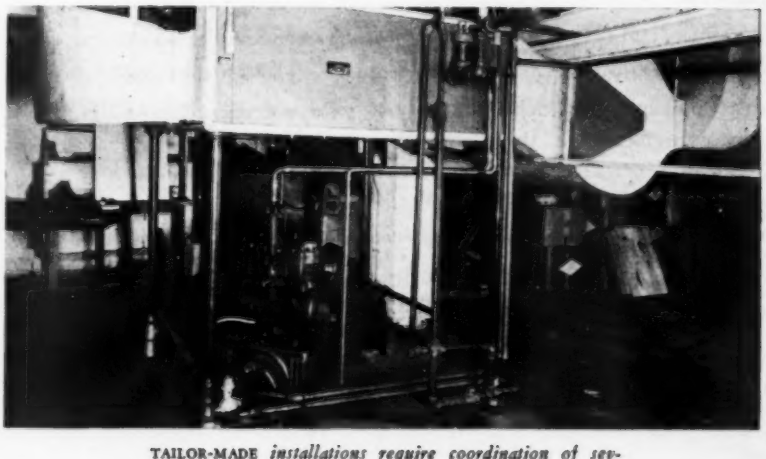
A sales-engineer's survey covers—

1. Sketches showing overall dimensions and structural details.
2. A cross section giving heights and clearances, full details of all windows, pipes and electrical outlets.
3. Data on the number of persons in all areas; number and kind of heat radiating sources, like electric lights, toasters, urns, ranges; sun exposure, tall adjoining buildings and other shade.

All equipment must be located tenta-



THE PRINCIPAL ELEMENTS *of one type of summer air conditioner, designed for small commercial applications.*



TAILOR-MADE *installations require coordination of several skilled trades and involve expert engineering to make system layouts fit the job.*

Write for 40-Page Bulletin Which Completely Illustrates and Describes

BULL DOG

UNIVERSAL TYPE

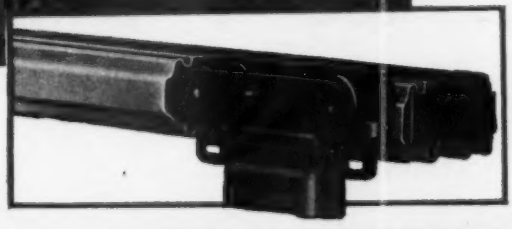
Trol-E-Duct

PORTABLE ELECTRICITY

50 Amp. 250 Volts 2 Conductors

Puts Lights and Tools On Wheels!

The view, at left, of a Modern Industrial Plant shows how Bull Dog Universal Type Trol-E- Duct provides a Flexible "Plug-in" system of Electrical Distribution for Lights, Electric Tools, Test Benches and numerous other applications where a Portable, Convenient and Flexible Source of Electric Current will increase Efficiency, Economy and Safety.



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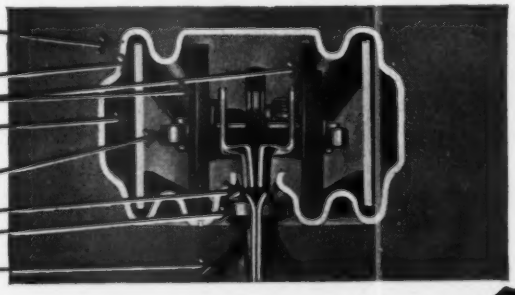

Typical Luminaire wired through Outlet Box to Terminal Type Trolley, ready to insert in Duct.

Portable Electric Tool connected to and suspended from Receptacle Type Trolley, inserted in Duct.

BULL DOG ELECTRIC PRODUCTS COMPANY

Pioneers of Flexible Electrical Distribution Systems

DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO, ONT.

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Prest-O-Lite Trade-Mark **TORCHES AND SOLDERING IRONS... *ideal for electrical work***

● ***Prest-O-Lite*** **Torches and Soldering Irons are available in convenient and moderately priced outfits, covering every open-flame or enclosed-flame requirement of the electrical contractor. These appliances are economical equipment for soldering, heating and brazing.**

Prest-O-Lite **appliances operate on** ***Prest-O-Lite*** **Gas, which can be obtained conveniently in small tanks at any of the thousands of** ***Prest-O-Lite*** **Gas Exchange Service Stations. You exchange your empty tank for a full one and pay for the gas only.**

Your jobber will gladly demonstrate the many features of ***Prest-O-Lite*** **equipment. Call him, or write the Linde office near you.**

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
New York and Principal Cities
In Canada

tively in relation to available space and to the scheme of air intake and circulation. These devices must be shown on floor plan.

Layout—Survey data is turned over to the engineer for a layout of the proposed system. This layout must incorporate the most economical arrangement of equipment units arranged for satisfactory operation, cost of building alterations and redecoration and other sub-contract operations.

The Bid—The estimate is prepared, to cover manufactured items and the various bids from sub-contractors. Next comes the preparation of a contract-specification. This represents the legal agreement with the buyer. It should be a complete resumé of the problem and scope of work to be done and a description of all equipment being furnished. The care with which this contract is prepared, and the guarantees made therein, will guide the installation routine as well as final adjustments and service work.

Sub-Contractors—The importance of employing reliable sub-contractors can not be over emphasized. A poorly constructed duct system, for instance, prevents the air from being properly distributed. And cheap insulation will cause wasted efficiency in refrigeration effects. The usual trades involved for the average installation are—

1. Brick layers
2. Carpenters
3. Lathers
4. Plasterers
5. Painters
6. Refrigeration mechanics
7. Electricans
8. Sheet metal work
9. Steam fitters
10. Plumbers
11. Pipe coverers

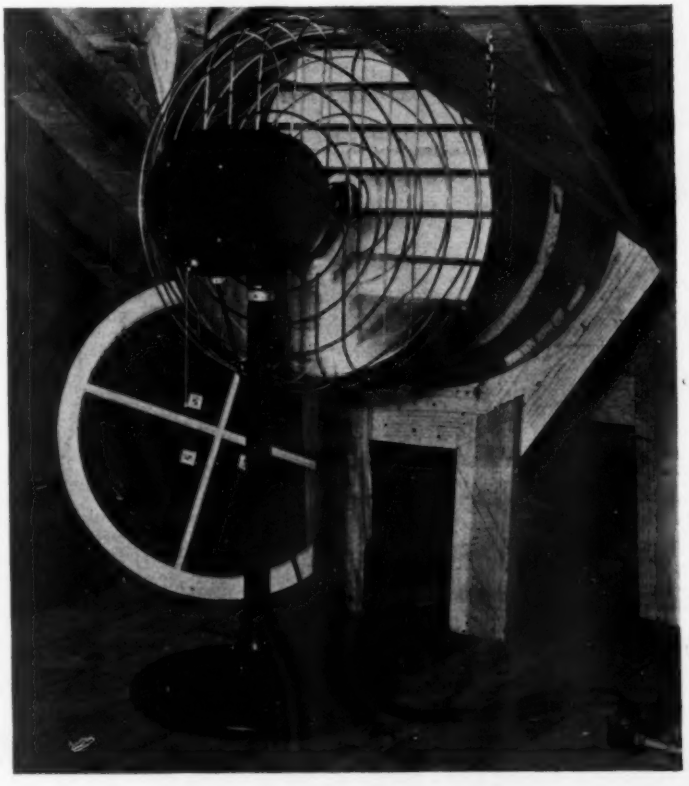
Some of this work may be handled without sub-letting it to other contractors.

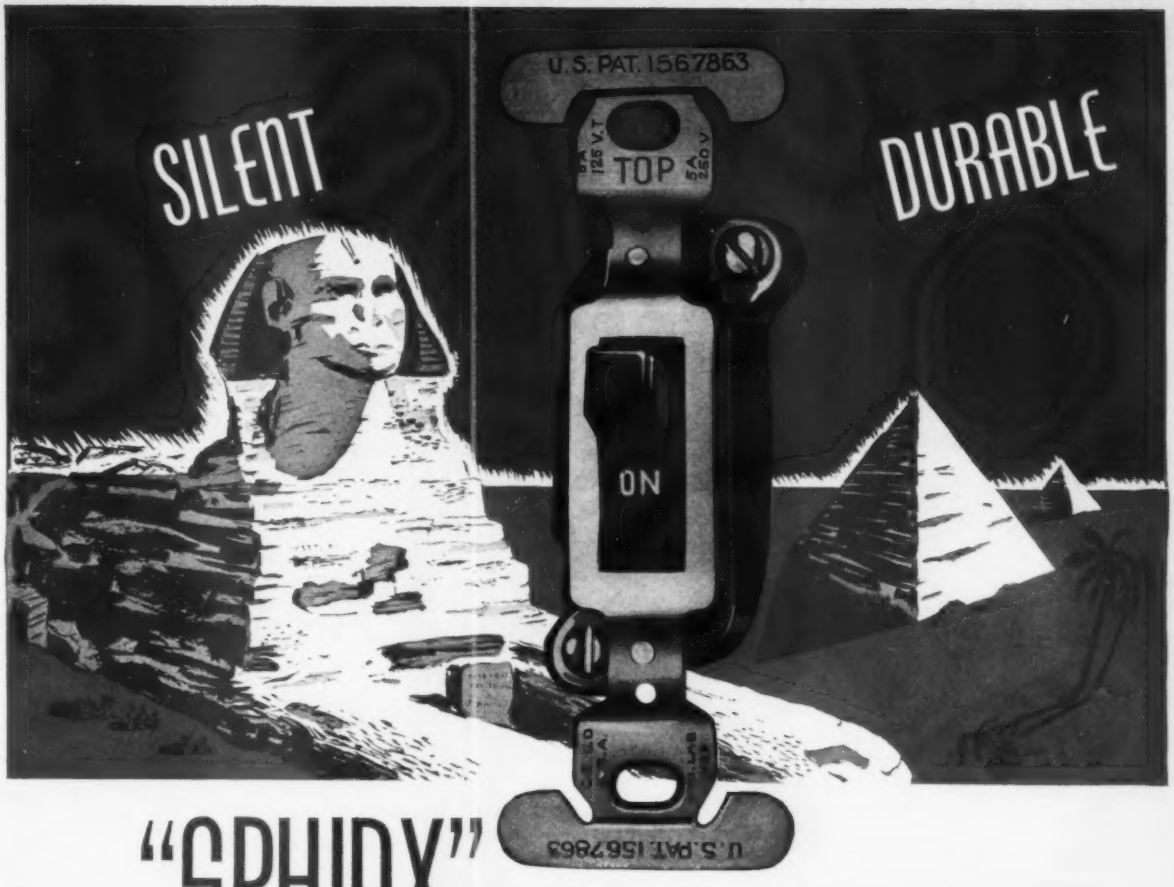
Through coordination of these trades the job can be completed with minimum delay. Here are the progressive steps, in which several trades may work jointly—

1. Laying foundations, structural alterations
2. Rigging equipment on the foundation
3. Fitting coils, nozzles, motors and pumps
4. Wiring
5. Other piping
6. Insulation covering
7. Duct making and erecting
8. Furring in ducts
9. Preliminary testing
10. Insulation of apparatus
11. Balancing

Electrical Features are an important part of the complete system. So the electrical contractor must select mechanics who are thoroughly familiar with the details of installation, adjust-

A FIRST STEP *that starts the family towards full air conditioning. Every home is a prospect.*





"SPHINX" G-E MERCURY FLUSH SWITCH

Now, a silent switch — the G-E "Sphinx" Mercury Flush Switch—in all standard types! Cushioned action—practically no noise on the make or break. Long life—no spring to break, no blades to hammer away—literally nothing to wear out.

Compare the features of this switch with those of the standard spring action switch:

1. Silent operation—practically no noise on the make or break.
2. Long life—no spring to break, no blades to hammer away.
3. Large binding screws, with heads that readily accommodate #12 wire.
4. Wide mounting ears that line the switch up on mounting surface without extra leveling means such as screws or washers.
5. Textolite casing, with arc completely enclosed in a glass-sealed metal button.
6. Textolite switch handle, either brown or ivory, with "on" and "off" markings.
7. Switch is for vertical mounting only—"top" on one support indicates correct mounting position.
8. Ratings: 5 amp., 250 volts; 5 amp., 125 volts, T, (T rating on 125 volts only) AC or DC.

The standard-type line is complete, with single-pole, double-pole, three-way and four-way switches that can be installed in any standard switch box. Approved by Underwriters' Laboratories.

For complete information, see your nearest G-E Merchandise Distributor, or write today to Section CDW-8172, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

WIRING DEVICES

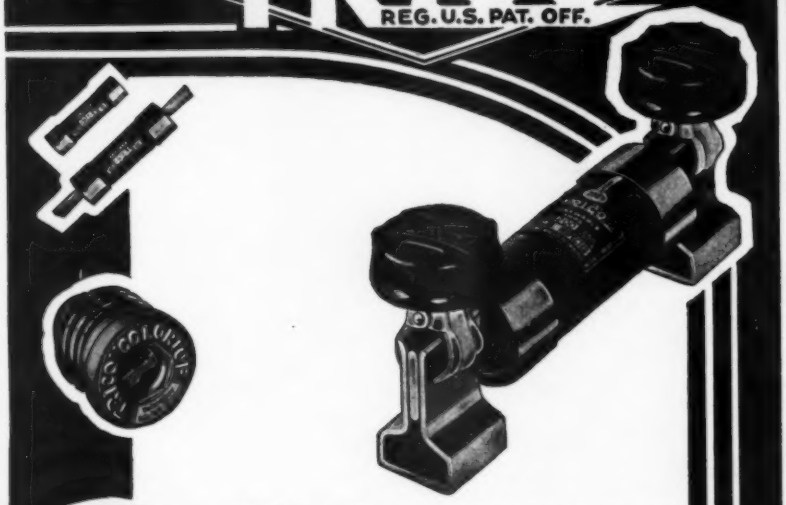
APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

UMI

For Profit— For Prestige—

INSTALL **TRICO**

REG. U.S. PAT. OFF.



NO MATTER how good your wiring job may be—cheap, shoddy fuses give the customer the impression that the WHOLE job is that way.

Leading Contractors know TRICO'S national reputation for outstanding quality—and how it adds that vital touch of **quality workmanship** and **material** to every finished job. That's why they say:—

"Give me TRICO—nothing else will do!"

Let us send you information on

RENEWABLE FUSES
With the famous *powder-packed* element

KANTARK "ONE-TIME" FUSES
With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES
America's Aristocrat of Plug Fuses

KLIPLOK CLAMPS
For Fuse clips

TEST CLAMPS
For heavy-duty testing

AUTOMATIC OILERS
For all motors, line shafts, etc.

FUSE PULLERS
Laminated for extra strength

TRY TRICO TODAY!

TRICO FUSE MFG. CO., MILWAUKEE, WIS., U.S.A.

In Canada—IRVING SMITH LTD., Montreal

TRICO REG. U.S. PAT. OFF. POWDER PACKED FUSES

STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS

ment and servicing of all these elements, including—

1. Motors for fans, compressors, pumps, condensers.
2. Automatically controlled starters.
3. Auxiliary controls, such as thermostats, hygrostats, humidistats, pressurestats, solenoid valves, surfacestats, transformers.

Tuning up—When the installation is in, begins the detail of giving the customer satisfaction. This is a job for the service man. These are his principal operations—

1. Inspect the installation as a whole and see that the contract is fulfilled.
2. Check the blue prints against the installation.
3. Make pressure tests for tightness and safety of refrigeration equipment.
4. Fill the system with its necessary ingredients such as water, oil, gas and brine.
5. Again check for safety, defects and tightness.
6. Put the system into regular operation.
7. Give special attention at this point to the control system which has not been tested or adjusted. A false step at this time might freeze up the equipment, overcool the conditioned space or cause drafty conditions.
8. Adjust the temperature control after the space has been brought down to temperature, balance the air, adjust air outlet and provide the proper amount of outside air.
9. Finally, instruct owner or engineer in the proper operation of the system.

FUNCTIONS OF AIR CONDITIONING

THERE are eight important features of air conditioning that may be used in various combinations—

1. Ventilation,
2. Air Circulation,
3. Filtering,
4. Noise Elimination,
5. Heating,
6. Humidification,
7. Cooling,
8. De-Humidification.

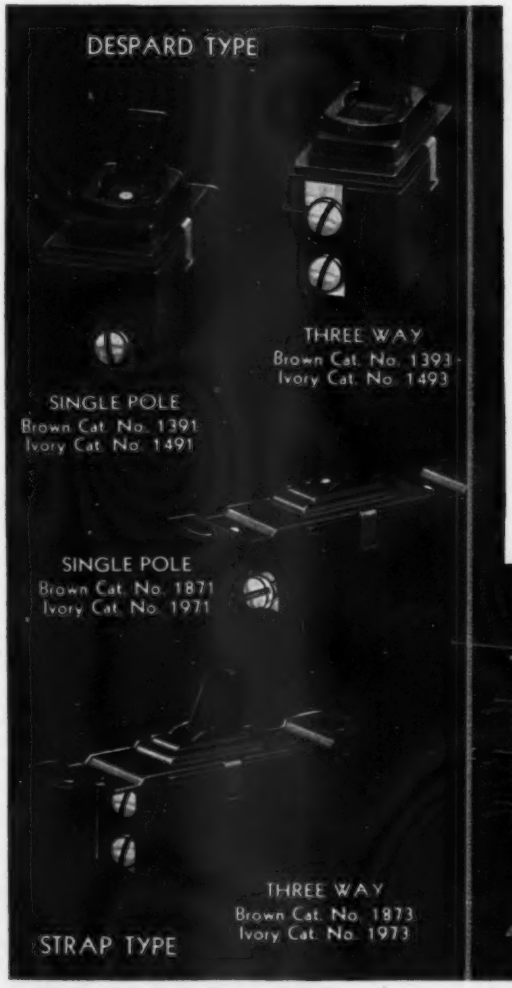
Complete air conditioning requires that in summer the air must be cooled, de-humidified, and circulated.

In winter the air must be heated, humidified, and circulated.

For year round conditioning the air must be cooled and dehumidified in the summer, heated and humidified in the winter, and circulated.

New Switches by P&S

For the "LOW PRICE" MARKET....



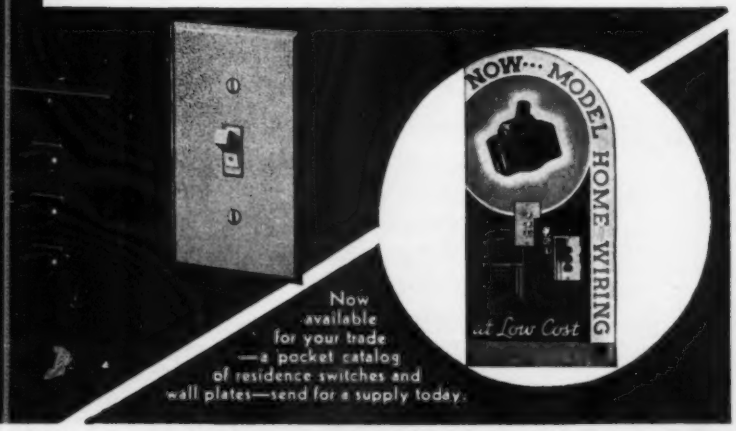
Four **NEW** switches—in both—**Despard** and **strap types**—designed for today's most active field—**the residential market.** Precision built mechanism—fewer moving parts—mechanically and electrically outstanding . . . and . . . favorably priced—**it's the switch value of 1938.**

FEATURES

Bakelite Body—fully enclosed.
Bronze Contacts—floating and self-aligning.
Arc snuffing barrier.
Bakelite Handle—insulated from strap and mechanism.
Positive kick-off.
Large head binding screws—extra length.
Full 10 ampere rating.

PASS & SEYMOUR inc.

SYRACUSE, N. Y.


NOW··· MODEL HOME WIRING
at Low Cost
Now available for your trade —a pocket catalog of residence switches and wall plates—send for a supply today.

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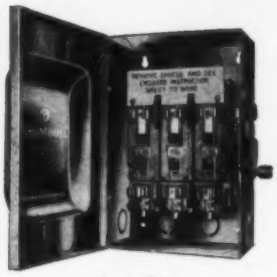
TRUMBULL
Safety Switches
for
AIR-CONDITIONING
INSTALLATIONS

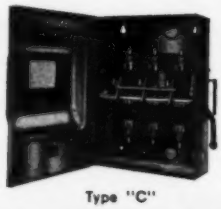


Type "RM"

Trumbull makes a complete line of the Safety Switches required for air-conditioning electrical installations . . . heavy and intermediate duty types, in all necessary capacities. In addition Trumbull makes a wide range of electrical control and distribution equipment which will find frequent application in this field, including motor starters and residential, commercial and industrial panelboards.

Write us for your copy of Catalog 101 which describes all of this equipment and other Trumbull products.

Type "A"



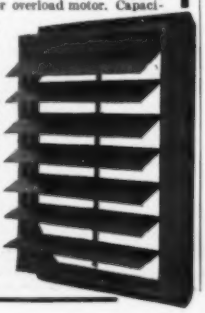
Type "C"

The TRUMBULL ELECTRIC MFG. CO.
PLAINVILLE CONNECTICUT

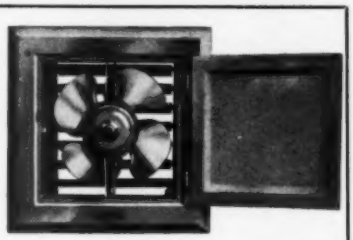
CERTIFIED RATINGS MEAN SECURITY
INSTALL
AUTOVENT
VENTILATION

★Elimination of air stagnation, dust and fumes is industry's most important problem. Even fire and explosion hazards are cut to minimum with AUTOVENT Equipment. Exclusive "31 Series" Propeller Fans will not churn air or overload motor. Capacities 500 to 38,000 CFM. Install "The Complete Line" — It's Profitable! Write for bulletins No. 200 and 201.

Automatic LOUVRES
★Install automatic louvres that prevent back drafts and afford weather protection for fan equipment. Write for bulletin No. 205.
Ask for price sheets and discounts!



AUTOVENT
FAN & BLOWER CO.
1815-21 N. Kostner Ave.
CHICAGO, ILL.



A KITCHEN NECESSITY
in Every HOME . . . .

Sell your customers this Signal Automatic Wall Box Kitchen Vent Fan . . . Removes Cooking odors, steam, excess heat . . . operates quickly . . . 10 inch fan, cast aluminum frame . . . list $32.00. See your jobber today and profit.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan
Offices in all principal cities

SIGNAL

HANDLING LARGE SYSTEMS

This procedure is cited by a leading air conditioning contractor with thirty-five years engineering experience in first heating, then refrigeration and now the air conditioning industry. An example is given to cover a prospect for air conditioning 50,000 square feet of banking space, in several floors of an existing office building—

1. Survey of building by one or more engineers.
   a. Tons of refrigeration required. Factors—solar radiation, glass and roof area, lighting loads, heat from motors, occupants and other sources
   b. Condition of present heating system
   c. Existing ventilation equipment and duct work. What parts can be utilized
2. Layout and Design
   a. Architectural treatment and structural changes
   b. Local ordinances as to air volume requirements
   c. Control of sound and vibration in building and through ducts
   d. Selection of heating, refrigeration and condensing equipment
   e. Selection of air circulation equipment
   f. Selection and location of control devices
3. Estimates and proposals
4. Prepare Working Drawings
   a. Final structural details
   b. Duct details
   c. Equipment details
5. Installation
6. Final adjustment of all equipment functions

Making Money

Air conditioning has proven itself a very promising field. Those who qualify themselves for one or more of its phases can make money. To undertake complete air conditioning installation, however, is a considerable responsibility, for there is serious overhead incurred in field engineering and in the preparation of estimates. If the air conditioning contractor is to realize a fair profit from operations, he must devise means of eliminating the financial drain of quoting too many jobs which do not materialize.

Meanwhile, there are other important markets for indoor comfort. Get better acquainted with their possibilities. Use your growing experience to build up sales and to develop genuine future prospects for that time, when you are ready to go in for the complete indoor weather market.

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The Jobs you READ about
TRIBORO BRIDGE
Connecting three Boroughs of
NEW YORK CITY
TRIANGLE CONDUIT
SELECTED AGAIN!
TO SERVE SEVERE REQUIREMENTS
A Triangle Product Rewards the Buyer!
NEXT ISSUE
The FIRST Building of the New York World's Fair
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding & Queens Blvds.
ELMHURST, NEW YORK CITY, N.Y.
It MUST be right!

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Editorials

Earl Whitehorne, Editor

High Ball For House Wiring

Word has come that the electrical press will have a private pre-view of the Adequate Wiring Program early in February. The plan is complete. The whole program will be distributed shortly and presented to the electrical industry in these pages next month.

What is it? It is just what we have needed—Lo! these many years. In a word, it is a campaign to sell more and better wiring into houses. It will provide any contractor, in any city, anywhere, with tools to work with in developing the market for residence wiring—if he wants to. And the whole plan, the whole opportunity for the whole industry will lag down or ride to glory on that point.

It has not been necessary for electrical men to neglect house wiring for twenty years. It has not been necessary to go on installing too few outlets and too small copper. But the public did not realize that all the time increasing use of more appliances and larger lamps was calling for greater capacity in wiring systems. And nobody told the builder and the householder, in any way that caused conviction, and created desire. So wiring has waited while the world rolled on.

The coming of a wiring program will not in itself create any business for contractors or wholesalers or manufacturers or power companies. But with it, these electrical men can do this long neglected job more easily. That's why it is important. But the point is that it will still call for thinking, for planning, for initiative, for smart selling.

A lot of new houses will be built in your town this year. The greater part of all the old houses need more wiring, more outlets. They can be sold. This material, this plan that is coming will help you—but it will only help. You have still got to build your own business. But if you want to make more money or more house wiring business, better start planning now—today. You better move out ready to go, in your town—all of you. And why not?

Self-Help For Motor Shops

Travelling around the country, visiting our leading motor shops, it is not uncommon to find too much money frozen in stockrooms. Too often the bargain in bought-in equipment has become a discouraging white elephant eating up space and cash. So NISA has proposed a plan to help sell rebuilt equipment though a central listing office. It offers to NISA service shops a chance to liquidate this bad luck by moving slow items that may be just what other members need.

Like all cooperative plans, success comes to only the extent that team work develops. This business of selling reconditioned apparatus is one in which there have been many abuses and misrepresentations. But operated under the sponsorship of NISA, and conducted solely within the confines of its own membership, the Rebuilt Motor Exchange Bureau offers self-help to those who should know its value.

These men have been faced with stale mate inventories. The NISA officers suggest the plan as "a dream come true." The plan and the machinery to operate it is now ready. Now those for whom the plan was conceived and the opportunity established must step out, by offering their own white elephants at a fair price and giving other members preference when buying used equipment.

Enjoy These Hard Times

If you like depressions—here we have another little one. What will you do with it? If you want to make the most of it, move fast for it won't last long.

Take a look at the Big Depression. Did any good come out of it Beyond a doubt it brought two very important benefits to the electrical industry. It opened the eyes of factory management to the possibilities of gaining new production economies through the use of more motors, more control, more electric heat and welding, and a wave of electrical modernization followed. It also brought an enormous development in the use of electrical appliances in homes—enough to more than fill the power company load curve valley caused by industrial inactivity.

So what? So don't lets forget it—right now. Another little chunk of hard times lies in the laps of the factory men. It waits principally on political fears. It is temporary. But capitalize it while you can. Go to every industrial customer of yours and urge immediate improvements that will increase efficiency.

And if the power companies could sell appliances so well during the early thirties, who is to say that domestic customers of yours can't be interested in adding outlets to their wiring right now? And what of stores and offices, where window and counter lighting may be improved to stimulate the business and the efficiciency of employees may be stepped up?

The old alibi that you can't sell people when they are low in mind, won't do. The Big Depression proved that. Whirl in and enjoy this so called "recession"—and there will be no hard times around your shop.

The Front Door— A Coming Opportunity

Bellmen were the first electrical contractors. They were the electrical industry not so many years ago. And now a lot of contractors have turned their backs on signal work and are ignoring this whole big field of communication. Apparently dollars in

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profit from this kind of wiring are not so sweet as dollars from high voltage circuits.

But, all the time, factories are growing bigger and more highly organized. The control idea is spreading—control of men as well as machines. Offices too are using more devices for time and step saving. And out of the news is coming a need that is going to develop a new gigantic industry that most men have not even glimpsed. We mean the need for protection at the front doors of homes, of individual apartments.

Because of the annoyance of being interrupted and argued at by bell ringing salesmen and because of crimes that are being committed upon women alone in apartments, this issue is rising high. A new fear has come into the home and something is going to be done about it. That something, of course, will be a communicating set whereby the woman answers all door bells with her voice and opens to no one whom she does not desire to admit.

This will be the contractor's business —if he wants it. When it starts, it may be one of his most important activities for several years. For there are many customers to be equipped.

Joy Lies In the Net

Power companies of this country connected up 794,000 additional customers last year. The figures are now out. There are now 27,000,000 consumers of electricity, all using wiring and this and that equipment. Some 160,000 farms too were added to those on the high lines. What a business to be in!

And speaking of business—the purpose is profits. And profits come not just from orders and work done but from management.

Smart contractors and motor shops are spending a little time right now at the opening of this new set of seasons, sizing up their own operations. For dollars that are saved by better methods are just as good in the bank as those gained by hard work and late hours. And dollars may be saved by better buying, better estimating, better handling of labor, better workmanship, better collections, better maintenance of plant and equipment —almost better anything, as long as it involves expense. All this needs planning and new ideas, as well as selling or production methods.

It is a great thing to be in an industry that is steadily growing—expanding both in number of customers and in its importance to them. But it is net that counts. Your business needs control as well as driving. It pays to do a workmanlike job of management as well as in your wiring and motor work.

Back Talk

Lighting Layouts

To the Editor—I for one hope the January issue of Electrical Contracting will be used as a pattern in assembling future editions of your very fine magazine. The composition and arrangement are extremely good, which adds greatly to the pleasure of reading.

In January, you announce plans for a more complete service in connection with industrial maintenance and then enumerate the various phases that will be covered in future issues. Since the survey of electrical contractors reported this month reveals that 84 per cent of them do commercial wiring, while only 68 per cent do industrial wiring, I am wondering if it would not be in keeping with your forward thinking to extend a similar service to the commercial field; somewhat in the manner in which you have in your article "Selling Light to Printing Plants." I admit this suggestion is motivated by a selfish interest in lighting, nevertheless I believe a complete series of lighting articles of the calibre of the one mentioned would certainly be real ammunition in any sales kit.

H. C. McDaniel
Central Illinois Public Service Co.

That's in the plan. Another lighting layout feature will appear next month and more to come. It will build up a data file of very practical value, we believe.

Indiana Co-op Comment

To the Editor—I have certainly appreciated your very excellent article about the Indiana Coops. This office represents not the competitive struggle for low prices, but the farmer himself looking for the lowest net results over a reasonable period of time. We have no other basic interest than the farmers own welfare. Five per cent of city fires are total losses. But it is 75 per cent in the country. It is our firm belief that if better wiring is needed, it is needed first in the farm homes.

We have no complaints whatever against the electrical contracting industry. But we have faced the early opening of a line in a county, where all the available electricians would reasonably require seventeen years to finish the job. A condition, which neither the contractors nor the farmers could avoid was before us, and while we were instructing, it was worth while to see that these wiremen did not know any way but the right way.

Within the period of 15 months more than 7,000 wiring jobs have been completed. Three counties have quoted themselves as finished. Yet the work of these country wiremen is by no means done even in these three counties. There will be further line extensions and continuing improvement in the understanding of the value and economy of electric energy for farming purposes. This too makes new jobs.

Please be assured that we appreciate the spirit of your article. Our own people are uniformly surprised to see a publication not versed in the details of co-operative work giving an account with so much fairness and such substantial accuracy. The main thing is to keep on bearing in mind the farmers' problems and the need he has for the safety of his family and his property.

Wilson Taylor, Director of Organization
Rural Electric Membership Corporation
Indianapolis, Ind.

Why not fairness and accuracy? What the contractor wants is the facts. And there is need for light on farm wiring, for there is so much of it coming. We believe that most of it will be done by qualified contractors, too, because the farmers want safety and good service.

These Salesmen

To the Editor—I will waste 3¢ of wampum to tell you that the editorial about dusting off scalps is mighty refreshing. There is a world of truth in that idea, particularly the realization that the average customer wants to buy what he wants and frequently hestitates to make a purchase because some dim-wit salesman, ignorant of his needs, tries to move out some dead stock or wastes time urging victrolas on inmates of a deaf and dumb asylum. Perhaps some early ancestor would have done well to market a good line of artificial scalps and incidentally if you put Westinghouse precipitrons in the tepee you just won't have any dust on your prize possessions.

S. G. Hibben, Director of Applied Lighting
Westinghouse Lamp Div.

Thanks, Sam, and where are these precipitrons? Maybe I should have a few in my aquarium if they don't bite.

That Open Letter

To the Editor—I want to tell you right now, that there are very few articles published in Electrical Contracting that I miss reading. As soon as I receive the magazine, I take it home and read it evenings where I can concentrate on it, and there is no one to bother me.

I think that your Open Letter to NECA was very helpful to our national association. A contractor not belonging to NECA, reading an article of this kind, I believe, would want to become a member of such a fine organization and give a little of his time to help the progress of the electrical contracting industry. I cannot see how he can afford to stay on the outside, since upon joining, he receives services and literature that will brighten his future and help the progress of his business.

H. C. Evans, NECA Exec. Committeeman
Central Division, Kansas City.

There is no question of the cash value of NECA membership to any man who wants to improve his management to make more money. Thanks for the comment on this paper. We're glad it too is helpful.

Let's Keep Our Wiring

To the Editor—I believe you have struck the keynote of the wiring contractors' problem. In my experience with electrical equipment sales I have seen outside organizations take over a large part of the business. General Motors or Montgomery Ward may take wiring, if we don't watch out.

In this territory electrical contractors were the only ones handling appliances at that time. Other merchandising outlets soon took it away. I believe your prediction is correct—that if the contractors as a class do not start actively merchandising and pushing electrical wiring, history will repeat itself. Most certainly the market is there.

We will do anything within our power to assist contractors in the territory we serve. In fact, we now have a couple of excellent contractors' organizations started.

Ralph E. Gale, Commercial Manager
Idaho Power Company, Boise

Good counsel—and this is not just a Big Bad Wolf. It is the resistless momentum of progress and change crowding up on us. Either the contractor will rewire America or somebody else.

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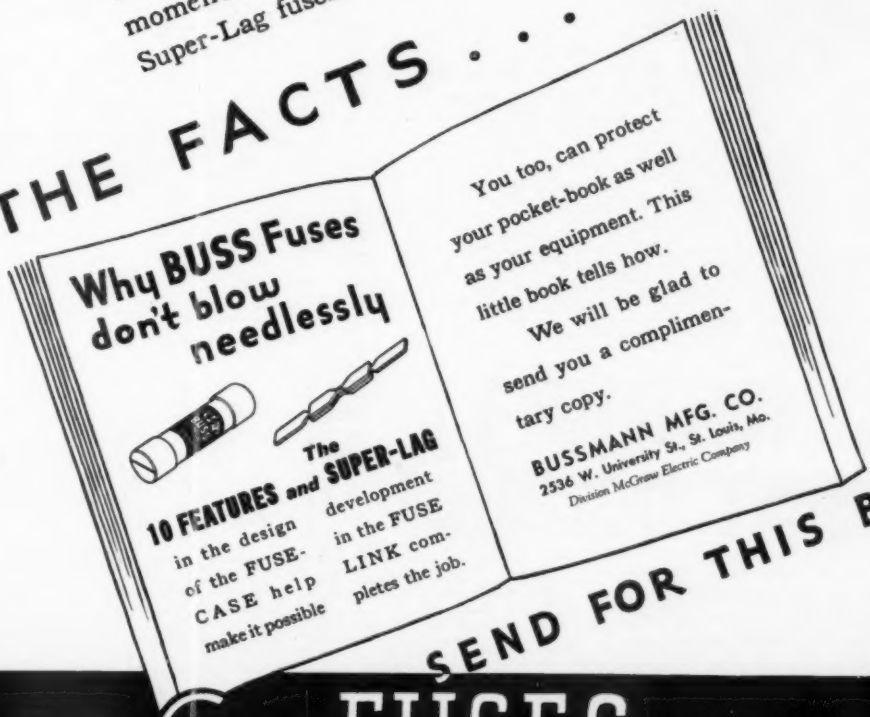
"I'LL TELL THE WORLD — BUSS FUSES SAVE US TIME AND MONEY!
THIS IS A CONGOLEUM GOLD SEAL RUG
KEIL
BUSS

— AND HERE'S HOW"

says Mr. A. Pollock, Ch. Electrician Congoleum-Nairn, Inc., Kearny, N. J. "We have to shut down our two roll sheeter several times every day to prevent sheets piling up on the next operation. Starting it again throws a heavy overload on the motor as the plastic material going thru begins to harden as soon as the machine stops. Ordinary 100 ampere 600 volt fuses were blowing about twice a week on this momentary overload. About June 15th, 1932 we installed BUSS Super-Lag fuses. They completely wiped out our fuse difficulties."

GET THE FACTS . . .


Why BUSS Fuses don't blow needlessly
10 FEATURES in the design of the FUSE-CASE help make it possible
The SUPER-LAG development in the FUSE LINK completes the job.
You too, can protect your pocket-book as well as your equipment. This little book tells how.
We will be glad to send you a complimentary copy.
BUSSMANN MFG. CO.
2536 W. University St., St. Louis, Mo.
Division McGraw Electric Company

SEND FOR THIS BOOK

Super Lag FUSES

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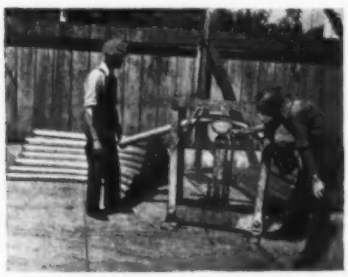
WIRING Methods

SHOP BENDS SAVE TIME IN FIELD

With a big job to install in Hawaii, H. H. Walker, Inc. of Los Angeles, found it possible to save time by making bends in 3-in. pipe at the shop, for use on this far-away project. This company also found this method helpful on other large jobs.

The hydraulic jack shown in the illustration was used in the yard of the company in Los Angeles to bend 119 pieces of 3-in. conduit on a 36 to 3 radius. The completed pipe bends were shipped by boat to Hickam Field, Army Air Post, in the Hawaiian Islands, where this contractor is installing an underground transmission line. This same hydraulic jack and several others of the same type were likewise used on the pipe job for the pumping plants on the metropolitan Water District aqueduct.



FOR HAWAIIAN JOB—Bends made in Los Angeles shipped by boat for installation in Hawaii.

IDENTIFICATION CODE FOR QUOTATIONS

Every quotation made each year by Garrett, Miller & Company of Wilmington, Del., is recorded in a journal, and the letter or bid is numbered consecutively, when it is typewritten. For instance, on July 1 this company sent out proposal number 324-37, which identified it as the 324th proposal made for 1937.

Beginning the next year, the first proposal will be numbered 01-38. At any time in the year this numbering method indicates how many bids have been submitted for that period, and may be readily compared with similar data for like periods of prior years.

As proposals are sent out, they are entered in consecutive order in a proposal journal. The entries give the date of submission, name of job, amount of proposal, name of estimator or salesman handling the matter, and a brief explanation of the scope of work. Spare columns are left for entering the final disposition of job, whether it was secured, lost, abandoned or revised. Each year the percentage of successful proposals is computed from these entries.

PARTITION MARKER

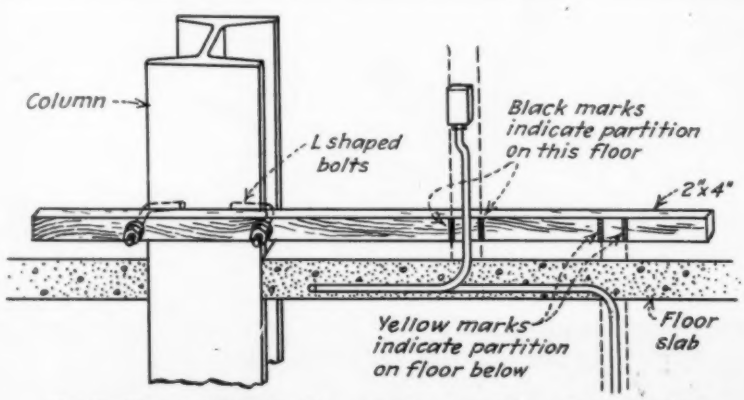
Kieswetter Electric Company of Syracuse clamped a 2x4 across the building column to provide a convenient method of marking partition locations. The plank was drilled for two L shaped bolts spaced to clear the web of the column. Drawing up the bolts, with the ends hooked around the web, held the plank securely in position during roughing-in operations. The locations and thickness of partitions on the same floor were marked on the plank with black lines. Those on the floor below were indicated by yellow lines. Much layout time was saved in bending down to boxes in thin partitions with these markers in place.

COMPACT UNIT HEATER CONNECTIONS

The new maintenance building for the Delaware River Joint Commission at Camden, N. J. utilizes several unit heaters in the auto truck storage and repair areas, for which exposed wiring was run along the brick partitions. This is the way that Strang Electric Company, local contractor, did the job.

A ½-in. home run conduit containing two No. 12 wires was terminated in a wall junction box near the fan motor. Armored cable connections were made between this box and the motor, and to an aquastat unit that was clamped to the steam pipe, which supplies the heater coils. A ¾-in. conduit containing seven wires was run from the junction box to a 30-amp. externally operated motor dis-

EXPOSED HEATER—Compact exposed wiring for unit heaters makes neat job on brick wall.



CONVENIENT MARKER—Shows location of partitions during roughing. L-shaped bolts hooked around the web of the column hold the marker in place.

PANTHER
FRICTION TAPE
3/4" HAZARD INSULATED WIRE WORKS DIVISION OF THE OKONITE COMPANY
No 8
3/4 PANTHER FRICTION TAPE No 8
DRAGON
NET WGHT. FRICTION TAPE
3/4" HAZARD INSULATED WIRE WORKS DIVISION OF THE OKONITE COMPANY
8 OZ.
3/4 FRICTION DRAGON TAPE 8 OZ.

PANTHER *and* DRAGON TAPES

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WILKES-BARRE PENNSYLVANIA

WE STILL MAINTAIN OUR ORIGINAL POLICY OF SELLING THESE TAPES THROUGH LEGITIMATE WHOLESALERS ONLY

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LONG LIFE ... with

APPLETON THREADED MALLEABLE UNILETS

• The durability of Appleton Threaded Malleable Unilets insures a lifetime of satisfactory service. Malleable iron construction gives them greater strength, yet they are light in weight. The cadmium finish assures positive resistance to rust and corrosion.

In every instance where long life is a factor, Appleton Threaded Malleable Unilets prove their superiority.

Sold Through Wholesalers

APPLETON ELECTRIC COMPANY

1704 WELLINGTON AVENUE CHICAGO, ILL.

NEW YORK: 76 Ninth Avenue
DETROIT: 7310 Woodward Ave.
SAN FRANCISCO: 655 Minna St.
ST LOUIS: 420 Frisco Building
LOS ANGELES: 340 Azusa Street
ATLANTA: 203 Luckie St., N.W.
CLEVELAND: 214 Hippodrome Building

APPLETON
Threaded Malleable
UNILETS
Reg. U. S. Pat. Off.
Wiring

connecting switch. From this switch, short nipples were extended into the motor controller at the right and to the thermostat at the left. The controller provides 3-speed snap-switch control, and by changing taps in the controller, a choice of 21 motor speeds was made available, in multiples of three switch positions.

A LETTER TO HOME BUILDERS

Midland, Texas, is not a large community, but every now and then someone builds a new home. A form letter is being used by the Phillips Electric Company to promote new business of this kind and it is getting results. The letter makes these suggestions—

1. Install a fuse panel or multi-circuit breaker large enough to take care of the present planned lighting system, also a spare circuit in case you want to add other rooms, a water well motor or any other additional electric load.
2. There should be special circuits for appliances such as the iron, mangle, washing machine and refrigerator. Of all the appliances used in the home, the iron is most likely to blow a fuse. And if your refrigerator is on a single circuit, the lights will not flicker as your motor cuts on and off.
3. Electric ranges require heavy-duty circuits and should be so wired to give maximum efficiency at all times.
4. Be sure there are enough convenience outlets. A minimum of one outlet for every fifty square feet of floor space or one about every twelve feet of wall space may be considered adequate.
5. Of course, you have thought of three and four-way switches so you can control a light from each doorway.
6. A telephone jack in each room is a very great help.
7. Door bells, buzzers and the beautiful new musical chimes add greatly to the convenience of a home. A floor-tread under the dining table saves many steps.
8. Radio plugs are indispensable. No unsightly aerials and ugly wires running under the windows. Simply plug in and that's all. All aerial and ground wires are concealed in the attic, and in the walls.
9. No home, no matter how small, is adequately wired unless it has some outdoor lighting. A floodlight for protection against prowlers, a few outside waterproof outlets for Christmas and garden lighting are good.
10. Then there is the question of a ventilating fan in the kitchen. It will pay for itself in added comfort and convenience. Electric clocks have special hanger outlets that are the last word.

The letter cites reasons for allowing at least 3 per cent of the construction cost of the home for wiring. It also urges the use of high grade materials, stressing that the foundation of electric service depends upon the permanency of the wiring installation.

Maintenance

MORE GUIDE SHEETS TO COME

MAINTENANCE is moving these days. Industrial processes change fast and bring new problems and responsibilities for the men who run the electrical system.

Correct solutions of these daily problems call for fundamental knowledge of electrical equipment and how it operates and why. No matter how experienced a man may be in maintenance work, he should periodically review the basic facts on which his work is grounded.

Therefore, we present here a "Check-up of Maintenance Practice," a series of Guide Sheets for the electrical maintenance man. Last month the job itself was taken apart and spread out plain. Number One, this month starts a review of apparatus—beginning with the application of alternating current motors.

Future articles will discuss—

2. DIRECT CURRENT MOTORS
   Types and Applications
3. ALTERNATING CURRENT MOTORS—Maitenance
4. DIRECT CURRENT MOTORS
   Maintenance
5. A.C. MOTOR STARTERS AND CONTROLLERS — Types, Applications and Maintenance
6. D.C. MOTOR STARTERS AND CONTROLLERS — Types, Applications and Maintenance
7. SPECIAL CONTROL PROBLEMS — Heavy Installations and their Maintenance
8. ELECTRIC DISTRIBUTION
   Circuit Protection
   Power Factor Correction
9. ILLUMINATION
   Types and Applications
10. ELECTRIC HEAT — Large and Small — Types, Applications and Maintenance; Furnaces
11. ELECTRIC WELDING
    Types, Applications, Control
12. INTERPLANT COMMUNICATION—Types and Common Maintenance Problems
13. INSTRUMENTS
    Types, Application, Care
14. POWER TOOLS AND APPLIANCES
    Types, Application, Care
15. BATTERIES AND RECTIFIERS
    Types and Special Maintenance Problems
16. ELECTROPLATING
    Maintenance Aspects
17. ELECTRONIC DEVICES
    Types and Applications

ALTERNATING CURRENT MOTORS —Types and Applications

NO MATTER how much we may know about alternating current motors, their use still presents many problems. Modern industrial processes continually call for new applications under unusual conditions. Therefore it is well to keep fresh the basic facts on a.c. motors and how they work and why.

Here then is the background story—for review—

A wide range of types and sizes of a.c. motors is available. Definite standards of characteristics and performance have been set up. Knowledge of these makes it possible for the maintenance man to select just the right motor for any particular drive he may require.

Three general reasons for the wide application of a.c. motors are—

(1) Wide use of a.c. system of generation and distribution.

(2) Recognized advantages of individual motor drive.

(3) Simplicity, sturdiness, and ease of maintenance of the motor itself because of its few wearing parts.

Polyphase and single-phase a.c. motors of many different kinds are in use. However, we will limit this review to the most commonly used motors, of about 500 hp. or less, with speeds ranging from about 180 to 3,600 r.p.m.

I. Polyphase Motors

In general, polyphase motors may be divided into two main classes, according to their principle of operation—*induction* and *synchronous*. Induction motors can also be divided into two classes:—*squirrel cage and wound-rotor* or *slip-ring*. Many modifications, both electrical and mechanical, of these general classes make it possible to secure motors which have the proper characteristics for any application.

A. *Squirrel-cage* motors are the most simple in operation and construction, and are most widely applied.

The rotor is a distinguishable feature of the squirrel-cage motor. The current-carrying conductors are fitted into slots provided around the laminated rotor core. All are end-connected in common to rings located at each end of the rotor.

They are readily adaptable to variations in starting and running torques by modification of the rotor design, the stator remaining basically the same. These motors are usually designed for single-speed applications. However, squirrel-cage motors can be designed to provide two, three, or four separate and distinct operating speeds.

B. *Wound rotor* or slip-ring motors differ from squirrel-cage motors only in the rotor winding, which consists of insulated coils, usually 3-phase, Y-connected. The leads are connected to slip-rings. This secondary circuit is extended to an adjustable external resistance. By inserting this resistance, with suitable control, during the starting period the motor can be made to develop a high starting torque with comparatively low starting current.

As the motor speed increases the resistance is gradually reduced, until at full speed the rotor windings are short circuited. The motor then operates at constant speed as a squirrel-cage machine with good efficiency and low slip.

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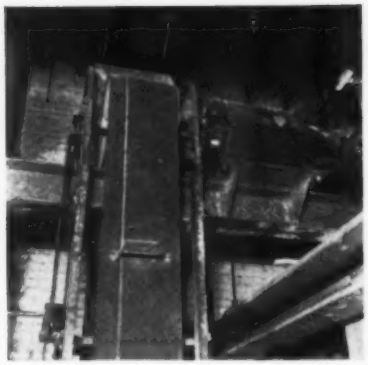
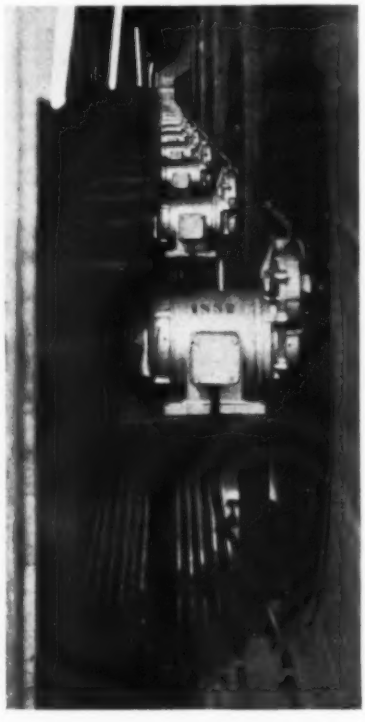


RUNS ALL DAY—This gearmotor drive, with a 3-hp., inclosed fan-cooled squirrel-cage motor direct-connected to the head pulley, operates a service elevator at 90 ft. per minute in the plant of City Mills, Columbia, Ga. The elevator is essentially a continuous belt, with handles and foot rests, extending the height of the plant. The motor must operate continuously, but loading varies widely as employees jump on or alight from the elevator.

***HIGH HEAT, HIGH HUMIDITY, AND REVERSE OPERATIONS** are the conditions under which motors must drive fans in the kiln-drying process at the Northwest Lumber & Mfg. Co., Everett, Wash. The 1,800 r.p.m. motors with gear reducers, drive the fans as exhausters, causing warm air and moisture from the lumber to pass over the motor. When the motors are reversed the fans operate as blowers and the air flow is in the opposite direction. The motors are in the heating coil alley, have special insulation, are inspected monthly, and require very little attention.*



Slip-ring motors are commonly used.

(1) where the excessive starting current of a large squirrel-cage motor would be objectionable.

(2) where the capacity of the motor is large with respect to the capacity of the generating plant, transformers, or lines from which the current is taken.

(3) With correctly designed external resistors in the rotor circuit, the motor may be used for speed control. Speed can be reduced approximately 50 per cent from normal, but when it is regulated in this manner the speed depends largely on the load.

C. *Synchronous* motors, as the name indicates, run in synchronism with the frequency of the supply circuit. The speed is therefore constant regardless of the load as long as the frequency remains constant.

The stator is similar to that of an induction motor. The rotor is of definite pole construction.

After the motor reaches approximately 95 per cent speed, excitation is applied and the motor should go to full speed and remain in synchronism with the supply circuit.

The torques which a synchronous motor is required to produce during starting are usually specified at standstill—termed "static torque"—and at 95 per cent speed—termed "pull-in torque"—with full a.c. voltage applied.

The maximum load which the motor can carry at synchronous speed without pulling out of step is termed "pull-out torque".

Static torque is usually considerably less than pull-out torque. For this reason, the load should be reduced as much as possible during the starting period.

II. Single-Phase Motors

For single-phase service three types of motors are most generally used.

A. *The repulsion-induction* motor develops a high starting torque and has running characteristics of an induction motor. Sizes range from ½ to 10 hp. constant speed. Its application is the same as for squirrel-cage motors of Classes A. B and C, (see panel page 50), as well as for elevator and reversing service. The mechanical modifications are practically the same as for squirrel-cage motors.

B. *The capacitor-motor* utilizes an external capacitor unit for both starting and running, and has uniformly high power factor and efficiency. Sizes range from ¼ to 10 hp. The motor is designed for general-purpose constant-speed applications, and develops high torque (250 per cent). It is also designed for constant speed or adjustable-varying speed, for direct connection or belt drive to fans.

C. *The brush-shifting repulsion* motor is available for adjustable-varying speed service. Sizes range from ¼ to 2 hp., with speed reduction to ¼ the motor rating. Horsepower output decreases as the speed is reduced. This type of motor is used on applications where adjustable speed is desired, as on small job printing presses.

D. *Fractional horsepower* motors, in general, include ratings ¾ hp. and under. Those for polyphase circuits are usually the squirrel-cage type. For single-phase circuits, four types of motors are available—

(1) shaded-pole type, 1/200 to 1/60 hp. constant speed—used on phonographs;

(2) split-phase type, 1/60 to ½ hp. constant speed—used on oil burners and washing machines;

(3) capacitor type, ⅛ to ¾ hp. constant and adjustable speed—for fans;

(4) series type, 1/100 to ⅙ hp.—used where high speed and high running torque are required for short periods, or where variable speed is desired.

III. Important Motor Characteristics

The maintenance man should be acquainted with the following characteristics:

1. *Starting Torque*—For squirrel-cage motors of various operating characteristics, minimum values of starting torques, which are known as normal, have been established. With full voltage applied, the starting torques range from 150 per cent of full-load torque for 2 and 4-pole motors to 105 per cent for 16 pole motors.

2. *Starting Current*—Normal starting currents were established for squirrel-cage motors. These range from 450 to 650 per cent of full load current, depending on the size and speed of the motor. Local regulations for starting-current values must be checked as it may be necessary to use a reduced-voltage starter for motors having low starting-current characteristics.

3. *Slip*—Slip is often important in selecting a motor for a specific application. It is the difference between synchronous speed and actual rotor speed under load, expressed as a per cent of synchronous speed.

4. *Voltage, Frequency*—Motor performance guarantees are based on normal or rated voltage and frequency applied at the motor terminals. Satisfactory operation can be obtained at rated load and frequency, if the applied voltage is within the limits of 10 per cent above or below rated voltage. Motors for 220-volt circuits will operate satisfactorily on network systems of 208 or 199 volts, *but not in accordance with the performance established at rated voltage.*

MOTOR CHARACTERISTICS AND SELECTION CHART

APPLICATIONS	MOTOR CLASS	MOTOR GROUP	MOTOR DESIGNATION	*STARTING TORQUE in per cent of Full Load Torque	*STARTING CURRENT in per cent of Full Load Current	PULL-IN TORQUE in per cent of Full Load Torque	PULL-OUT TORQUE in per cent of Full Load Torque	SLIP in per cent
Fans: Centrifugal, Propeller; Pumps: Centrifugal, Rotary, Turbine; Lathes, Shapers, Drill Presses; Circular Saws: Small and Medium	Squirrel Cage Induction — constant speed	1	Normal Torque; Normal Starting Current	135 to 200%	Full Voltage Applied. 500 to 650%. Usually started on reduced voltage	—	Not less than 200%	3 to 6%
Positive Pressure Blowers; Line Shafts; Small Stokers; Metal Grinders; Planers; Joiners, Molders, Sanders, Laundry Washers; Job Printing Presses	Squirrel Cage Induction — constant speed	2	Normal Torque; Low Starting Current	135 to 175%	Full Voltage Applied. 400 to 500% Meets E.E.I. requirements up to 30 hp. Above 30 hp. starting currents may not be within E.E.I. Limits	—	Not less than 200%	3 to 5%
Pumps: Reciprocating, Displacement; Compressors: Air, Refrigerating; Crushers: Without Flywheels; Dough Mixers, Ball Mills, Large Band Saws; Foundry Tumbling Barrels; Conveyors: Starting Loaded; Bucket-type Elevators; Grain Elevator Legs; Turn Tables	Squirrel Cage Induction — constant speed	3	High Torque; Low Starting Current	200 to 250%	E.E.I. Limits up to 30 hp. 1800 r.p.m. 450 to 550%	—	Not less than 200%	5 to 7%
Passenger and Freight Elevators	Squirrel Cage Induction — constant speed	4	High Torque	300 to 400%	300 to 500%	—	Not less than 250%	12 to 18%
Cranes, Hoists, Lifts, Valves	Squirrel Cage Induction — constant speed	4	High Slip	Same as for elevators except motor will not meet all conditions as to voltage fluctuations and quiet operation		—	Not less than 250%	12 to 18%
Punch Presses, Shears, Laundry Extractors, and drives with flywheels or high inertia to accelerate	Squirrel Cage Induction — constant speed	5	High Torque Medium Slip	300 to 400%	375 to 500%	—	300 to 400%	7 to 12%
Drives requiring large starting torques and minimum starting currents, as conveyors, hoists, fans, pumps, compressors, etc. Reduced speed operations of fans, pumps, etc.	Slip-Ring Induction	6	Wound Rotor Induction Motor	Depends on External Rotor Resistance		—	Not less than 200%	3 to 5%
Reciprocating Air Compressors and other machines which can be started light.	¶ Synchronous	7	Low Speed 100% P.F.	40%	275 to 300%	40%	150%	—
	¶ Synchronous	8	Low Speed 80% P.F.	40%	250 to 275%	40%	225%	—
Drives requiring 200 hp. or less and 514 r.p.m. or over	¶ Synchronous	9	General Purpose 100% P.F.	110%	500%	110%	150 or 175%	—
Drives requiring 150 hp. or less and 514 r.p.m. or over	¶ Synchronous	10	General Purpose 80% P.F.	125%	575%	125%	200 or 250%	—

Above values will serve as a guide. * Larger values of torque and current apply to the higher speed motors. ¶ Synchronous motors are also made to meet other requirements of torque, speed, etc.

UMI

Output, starting, and maximum torque of an induction motor will vary as the square of the applied voltage.

Reduction in torques should not affect the usual application of polyphase induction motors, because starting and maximum torques are not usually the limiting factors. However, where standard motors are to be used on torque applications, such as hoists, cranes, elevators and valves, the question of reduction in torque should be given careful consideration.

Standard motors will operate successfully on frequencies 5 per cent above or below normal. The output, starting, and maximum torques will be increased slightly with a drop in frequency, and decreased with an increase in frequency.

Classes of A.C. Motors

1—SQUIRREL CAGE, CONSTANT SPEED

A—Normal starting torque, Normal starting current. Sizes: 1 to 1,000 hp. for low voltages, and up to 15,000 hp. for high voltage, direct connection.

B—Normal starting torque, Low starting current. Sizes: 7½ to 500 hp.

C—High starting torque, Low starting current. Sizes: 7½ to 500 hp.

D—High torque, High slip. Sizes: 1 to 50 hp.

E—High torque, Medium slip. Sizes: 3 to 50 hp.

2—SQUIRREL CAGE, MULTI-SPEED

A—Constant horsepower

B—Constant torque

C—Variable torque
Sizes: 1 to 200 hp.

3—WOUND ROTOR

A—General Purpose

B—Crane and Hoist
Sizes: 1 to 1,000 hp. in low voltages, and up to 15,000 hp. for high voltage, direct connection

4—SYNCHRONOUS

A—General Purpose

B—Low Speed
Sizes: 25 to 5,000 hp.

5—REPULSION INDUCTION
Sizes: ⅛ to 10 hp.

6—CAPACITOR

A—General Purpose

B—Fan Service
Sizes: ¼ to 10 hp.

7—BRUSH-SHIFTING REPULSION
Adjustable Speed.
Sizes: ¼ to 2 hp.

8—FRACTIONAL HORSEPOWER

A—Shaded-pole

B—Split-phase

C—Capacitor

D—Series
Sizes: 1/200 to ¾ hp.

IV. Mechanical Modifications

There are a number of mechanical modifications of induction motors. The important ones are:

1. *The splash-proof* motor is so constructed that dripping or splashing liquids will not enter the motor. However, as the motor is self-ventilated, and as moisture-saturated air may be circulated through the motor, the windings are given special moisture resisting treatment. Motors of this construction are used to drive pumps, and on machinery in such places as dairies, paper mills and chemical plants.

2. *The totally enclosed fan-cooled* motor has totally enclosed windings and rotor; cooling air is circulated over the enclosure to carry away the heat. This motor is used widely where the air contains dust, as in grain elevators, coal-handling plants, large foundries, and machine shops.

3. *The explosion-proof* motor is similar to the totally enclosed fan-cooled motor but so constructed as to prevent any explosion which may occur within the motor, from igniting gases or dust in the surrounding air.

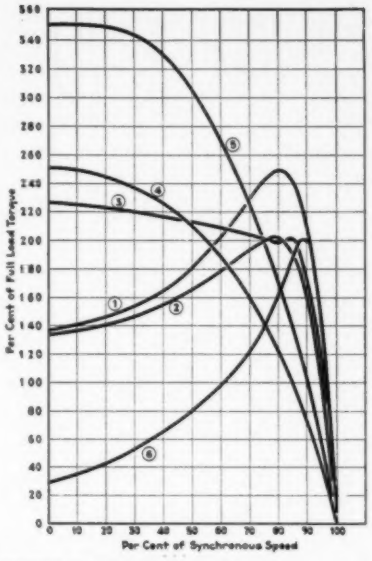
4. *The gearmotor* is usually built with a gear mechanism and the motor as an integral unit. In some cases the gear unit is designed to permit the use of motors having the other mechanical modifications, as well as the electrical characteristics outlined in the chart, page 49. This construction is often used to connect motors directly to low-speed or high-speed loads.

5. *The vertical* motor has the shaft vertical to the working plane. Mountings are flange, ring-base, tripod-base, or with machined end shield for mounting on the bolt circle of a machine.

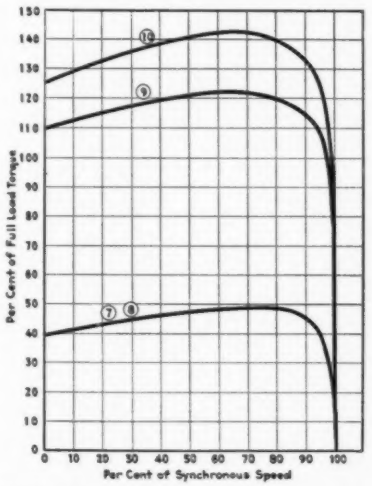
V. Selection of Motors

The selection of a motor for a job is usually relatively simple, and, with minor variations, can be based on similar jobs. However, to insure correct application, these important requirements should be kept in mind:

1. Starting or break-away torque.
2. Accelerating time.
3. Frequency of starting.
4. Speed requirements.
5. Variation of load.
6. Special limitations imposed by the power supply.



TYPICAL SPEED—TORQUE curves of induction motors. Circled figures refer to group numbers in chart.



TYPICAL SPEED—TORQUE curves for synchronous motors.

7. Type of drive—direct, belted.
8. Position of motor with respect to driven load.
9. Condition of surrounding atmosphere—temperature, dust, gas.
10. Noise.

After determining the characteristics of the load, a suitable type of polyphase motor can usually be selected from the motor characteristics and selection chart on page 49.

In the majority of cases, standard motors can be selected. However, there will always be some special applications which are not covered by the standard types—Important special conditions affecting the choice of motor drives are high voltage, reversing duty and dynamic braking.

The new Benjamin Skylight Fixture brings a new advance in the scientific lighting of all locations involving shiny surfaces. Moreover it meets the demand of countless thousands of locations where soft, shadowless illumination is essential.

In effect, the Benjamin Skylight Fixture provides a luminous ceiling of glareless light directly over the work. Its unusually large size and extreme low surface brightness not only increase seeing efficiency and reduce eye fatigue but also facilitate critical inspection work involving detection of minute surface imperfections, waviness, etc., on all bright, polished surfaces.

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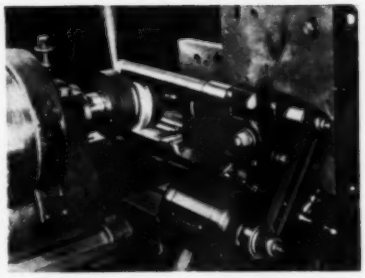
F-M Motors



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Electric Heat Aids Welding

The boilers and high pressure steam lines of the new 1,200-1,400 lb., 900 deg. F. topping turbines for the Waterside Station of the Consolidated Edison Co. of New York, Inc., were welded with a battery of 32 Westinghouse Flex Arc welders. This is said to be one of the largest jobs of its kind. Each weld had to undergo an X-ray examination upon completion.

The pipe area on each side of the joint had to be preheated, before a weld was started, and annealed when completed. Electric heat was employed for this purpose—resistance wire holding the pipe to 600 deg. F.

The main steam pipe is carbon molybdenum for which special welding

***PREHEATING** and annealing arrangement for welding 14-in. pipe. Resistance wires held pipe at 600 deg. F. during welding.*

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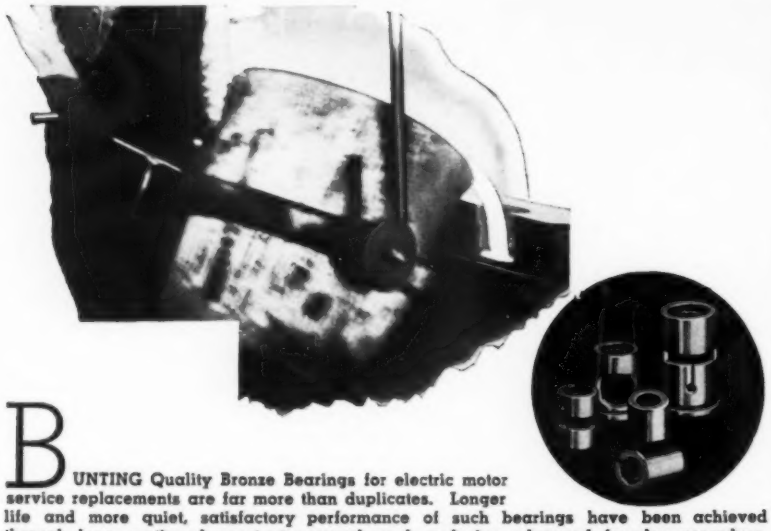

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Magnet Wire: We handle Essex wire—drawn and rolled from the best grade Electrolytic Copper rod stock. A complete stock of round and square magnet wire kept in stock. Rectangular sizes shipped from our Detroit factory just as promptly. Our catalog features this line completely.

Manning Insulating Papers: Manning 300, highest quality, non-chemical, all-rag paper. Extremely tough. Superior heat aging qualities. All sheets are given an over-all dielectric test at 300 volts per mil.

MANNING B: Highest quality non-chemical, 50% rag paper. Made by the same process as Manning 300. Unusually tough. Good heat aging qualities. A high density paper of superior quality at a lower price. See our catalog.

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Our new catalog features the approved products we handle—by using this catalog it is a simple matter to take care of any requirement and obtain parts made by reputable manufacturers.

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Headquarters
One Source of Supply for Wire and Insulating Materials
Quality - Dependability - Service

INSULATION
INCORPORATED
2127 PINE ST., ST. LOUIS, MO.

rod was used. The enormous steam pressures and high temperatures that these lines will carry when finished made it necessary to give the welding operators special instructions and tests before qualifying them to work on the pipe joints.

CURRENT TRANSFORMERS— Their Use and Abuse

By W. H. Bollinger

The Esterline-Angus Co., Indianapolis, Ind.

Current transformers are very handy devices. They greatly extend the range of a.c. ammeters and wattmeters and can provide readings with excellent accuracy if used correctly. However, simple as they are, certain fundamental principles must be followed in their use. Here are the more important ones:

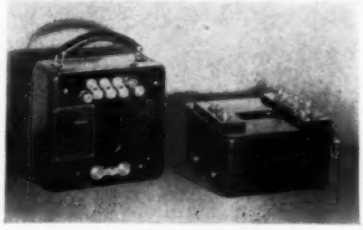
1. When connecting two or more instruments to the same current transformer, connect their current coils in series, not in parallel.

2. Don't use a split-core current transformer with any kind of wattmeter or power factor meter. The small air gap introduces a noticeable phase-angle error, particularly when the load power factor is low.

3. Don't use a split-core current transformer having a primary rating of 500 amp. or smaller with a graphic recording a.c. ammeter, unless the ammeter and split-core current transformers have been calibrated together and intended to be used as a unit.

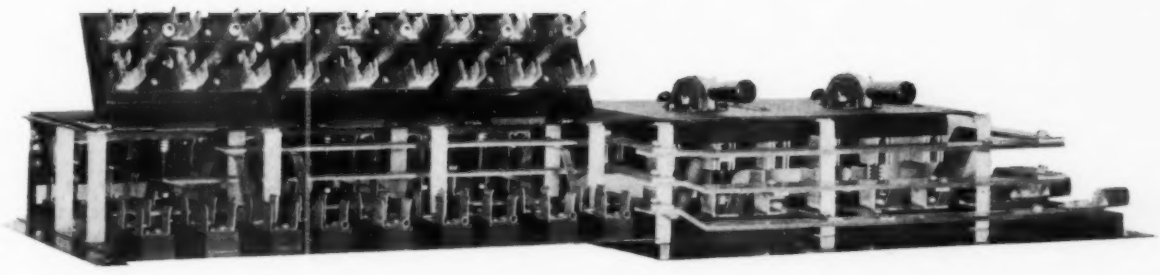
4. When using graphic recording ammeters and wattmeters, make sure that a current transformer of sufficient volt-ampere capacity is used. Overburdened current transformers may introduce noticeable errors.

5. When using a through-type current transformer, the number of primary turns is determined by the number of times the power lead passes through the opening. (Note this very carefully as it is a common mistake to count the turns elsewhere, which may be one more or one less.)

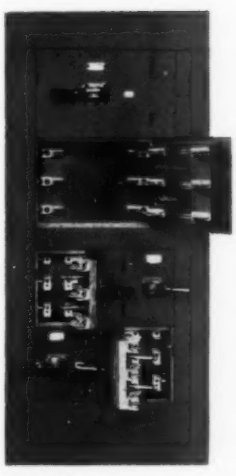


CURRENT TRANSFORMERS, portable, nine-range, of closed-core type. Suitable for use with ammeters, either indicating or graphic recording types.

HERE'S A "Breather"



for CONTRACTORS grown tired of working with OVER-CROWDED PANELS and SWITCHBOARDS!



*SAFETY
SSTURDINESS
SIMPLICITY

• Both literally and figuratively, the word "breather" truly applies to Cleveland Triple S* Distributing Boards!

To the contractor, for instance, the open-design of Cleveland Switchboard Equipment is a welcome relief from the tedious, time-wasting installlations of unnecessarily crowded and hard-to-get-at panels. In Cleveland Panels, there are no partitions to interfere with the work . . . so every job moves faster and shows a bigger margin of profit.

Then, from the standpoint of the *customer,* this lack of partitioning literally gives Cleveland Panels a chance to breathe freely . . . allows the heat to rise from switch parts and fuses, resulting in trouble-free service and longer life. Their open design also permits easier inspection, less costly maintenance . . . and all parts are removable without disturbing the rest of the board.

Send for the new Cleveland Switchboard specification manual so you'll have it for ready reference whenever you need it . . . you'll find there's a type and size for every requirement.

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RIDGID No. 65-R Threader

Saves you time and bother

Changing Dies!

You've got more important things to do than changing dies to thread 1", 1¼", 1½" and 2" pipe. And this RIDGID No. 65R saves you the trouble—all pipe, all threads.

For in this remarkable tool, the same set of dies threads all 4 sizes perfectly. Simply move setting post to size you want. No extra dies to lug around, to worry about losing.

Slick work-holder, too — sets quickly to pipe size, tightens with one screw.

A strong, beautifully balanced tool pleasing thousands by its fast clean work. Try it—you like the "feel" of it at once. Buy from your Jobber.

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Stop Pipe Wrench Repairs

That RIDGID guarantee ends fully 75% of your pipe wrench repairs and wrenches out of service. More features you'll like than any other wrench. Buy to day.

RIDGID

PIPE TOOLS

HANDY CONNECTORS, to which primary of current transformer is connected. The connector is then inserted in the fuse cut-out. Different sizes are available for the various sized cut-outs.

6. Where it is difficult to open a circuit in order to use a closed-core current transformer, devices on the market known as "Quick Connectors" or "Handy Connectors" will be found valuable.

7. It is always dangerous for the operator, as well as harmful to the insulation of the current transformer, to open the secondary of any current transformer. This is particularly true of current transformers on circuits carrying over 1,000 amp. Most current transformers are equipped with a short-circuiting switch that will completely eliminate this hazard, *if it is not overlooked.* (For transformers of 100-amp. primary rating or less, the voltage developed across an open-circuited secondary is seldom dangerous.)

8. If it is desired to totalize the current in two or more circuits, whose frequencies are in synchronism, and the current transformers are all of the same ratio, this can be done by paralleling the secondaries of all the current transformers in each phase.

Rejects Reduced

In a 60-in.-long pot, especially insulated for the purpose, four 3-kw. Calrod units and thermostatic control provide uniform heat for a continuous-seam-solder-bath at the Phillips Can Co., Cambridge, Md. Results: rejects practically eliminated; fuel costs reduced 50 per cent; working conditions improved; and fire hazard removed. The pot is turned on automatically at 4 a. m. and is ready for production at 7 a. m. Automatic control relieves the operator of responsibility for maintaining temperature, and eliminates the need for adjustment of the heat source.

The successful results obtained from the first installation have led this company to use electric heat in all eight of its solder pots. The other seven installations have three 5-kw. through-the-bottom Calrod units. With these, an even better heat distribution is provided throughout the solder pots.

BM TELESCOPE SYSTEM

CONNECTORS AND COUPLINGS

White Zinc Finish for Electrical Metallic Tubing

No complicated installation, troubles, nor lost time when you use B-M Connectors and Couplings. Just two squeezes on the handle of the B-M Indenter and the B-M Connector or Coupling is securely fastened to the Electrical Metallic Tubing.

Contractors find them indispensible because of their great simplicity. Our tools and method of fastening the fittings to the tubing are patented, and we limit the license of our tools under these patents to the installation of our fittings only.

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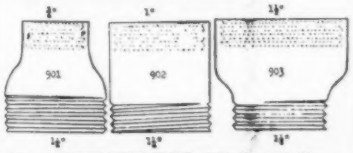
Quickly installed Reducing Adapters

Adaptable to the Westinghouse meter socket; 904-5-6 is an eccentric type which, by turning, will line up the meter socket with the switch, making a flush mounted job.



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The ELECTRICAL BUYERS REFERENCE

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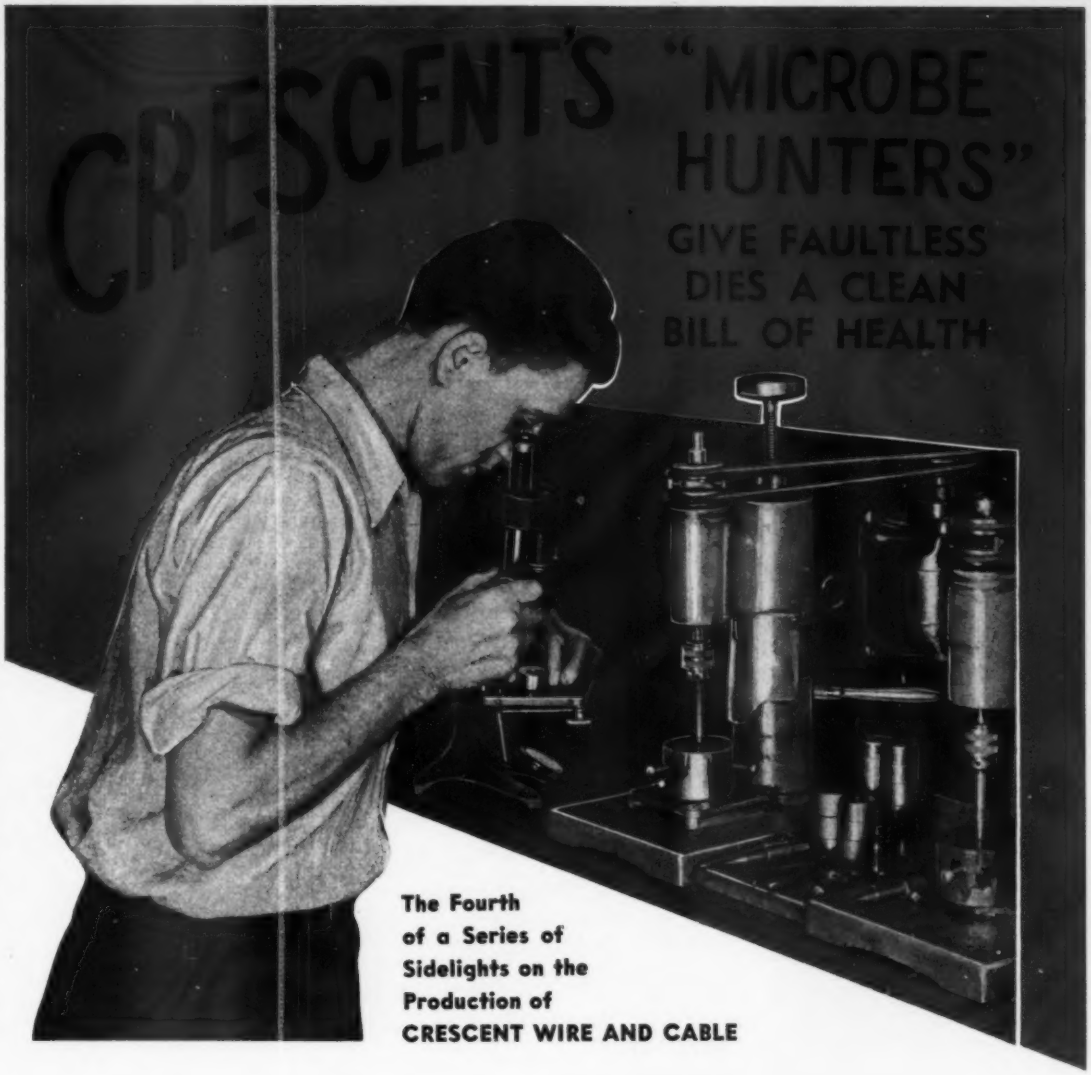
It will save you time and money!

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE



The Fourth of a Series of Sidelights on the Production of CRESCENT WIRE AND CABLE

Eagle eyes peering through this binocular microscope can detect the most minute flaws that tend to mar the finish or shape of dies used in drawing copper for Crescent Wire and Cable. And close at hand, is some of the precision sizing and polishing equipment necessary for the shaping and maintenance of tungsten carbide dies.

Such close control over all forming tools is a standing "must" order in the Crescent plant to insure accuracy and uniformity of wire and cable sizes.

CRESCENT
INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY

Jobber Co-Operation — A Permanent Policy

CRESCENT ENDURITE SUPER-AGEING INSULATION • WEATHER PROOF WIRE

UMI

Motor Shops

OVEN AIR CIRCULATION

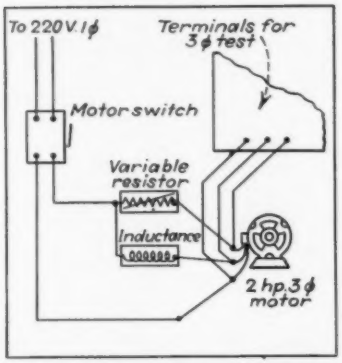
Continuous circulation of hot air in the oven speeds up the baking process. An electric oven in use at the Clement Industrial Electrical Co. of Grand Rapids, Mich. is equipped with a blower in the oven ceiling. The hot air passing over the heating bars between the outer and inner walls is

CIRCULATING HEAT is kept in motion in this bake oven by a blower in the ceiling.

drawn up over the ceiling and blown down into the oven. Openings in the bottom of the inner wall allows the air to recirculate over the heaters. The heaters are automatically controlled by a thermostat and time switch.

PHASE ROTATION FOR TESTING

Three phase current is provided to the terminals of a motor testing switchboard at the Commercial Electric Company of Joliet, Ill. from a single phase service through a simple convertor circuit. One terminal of a 2 hp, 1750 rpm wound motor is connected directly to one side of the 220 volt line. The two other leads are connected through



CONVERTOR CIRCUIT — Used to provide phase rotation at the terminals of a motor testing switchboard.

an inductance and resistance respectively to the opposite side of the line. The three motor leads are extended to the test terminals on the board. With the motor operating at full speed with no load, the phase characteristics at the test terminals are suitable for operating small three phase motors.

ADJUSTABLE ARMATURE RACK

Metal stands ordinarily used for holding armatures have heavy metal bases of considerable width, which do not permit the supporting columns to be brought close enough together to take the smaller armatures. Consequently, R. O. Johnson, manager of the Skeen Electric Works, Portland, Ore., has built this adjustable armature rack, which not only takes the smaller armatures but larger ones up to 25 horsepower.

It is built of two by fours, as shown in the photograph, and is mounted on casters. The middle member slides through an opening in the left hand support and is held in any position by a wooden wedge. This permits the adjustment of distance between the two supporting columns, over a range of approximately two feet.

HANDY RACK—Mounted on casters, it adjust with ease to handle any armature up to 25 hp.

LOADING HOIST

A five ton capacity chain hoist is used by the Penn Electrical Engineering Company in its motor shop in Scranton, Pa. It is suspended on a trolley beam, supported between the loading platform and a heavy column at the opposite side

BOOM FOR LOADING—No skids or rollers needed to load heavy equipment on trucks with this boom and 5-ton chain hoist at doorway.

of the driveway. With this equipment, very large pieces of machinery and heavy apparatus are easily loaded directly onto the truck body without skids and rollers.

TESTS FOR PLATING GENERATORS

A wall-mounted assembly of pipe coils, which resembles a factory steam radiator, provides artificial loads up to 10,000 amps. for testing large plating generators that have been repaired by the Electrical Installation Company of Cambridge, Mass. The generator leads are connected with lugs to a selected portion of the coil system of resistance, and cold water is circulated through the pipes to hold down overheating while tests are being conducted.

Coils were made of 1¼-in. pipes and reverse bends, the bottom row of bends having flat iron lug-bolting plates brazed

TRUMBULL

Control

"CM" MAGNETIC MOTOR STARTERS

"In selling Trumbull Magnetic Switches, I have found there's one feature in particular that rates "tops" with contractors, engineers and maintenance men, and that is that all parts . . . including magnetic coils . . . are accessible from the front, easily inspected or removed . . . making maintenance no problem at all."

"Yes, and another feature that registers is the use of non-carbonizing glazed black porcelain bases that prevent dangerous accumulation of dust or carbon and guarantee against flashover. This entire starter mechanism is mounted on a single steel back plate . . . removable as a unit for easy wiring."

"Identified control terminals for leads to push-button stations prevent errors in wiring. And don't forget that the handsome, round cornered, gray-enameled steel boxes have the "eye appeal" that's a mighty important point in modern installations."

These Magnetic Starters will be further illustrated and described in the February issue of TRUMBULL CHEER . . . the interesting and informative monthly that goes to 35,000 electrical men. Be sure your name is on the list.

The TRUMBULL ELECTRIC MFG. CO.

PLAINVILLE — A GENERAL ELECTRIC ORGANIZATION — CONNECTICUT

NEW YORK • CHICAGO • BOSTON • DETROIT • ATLANTA • PHILADELPHIA • LUDLOW • NASHVILLE • SAN FRANCISCO • LOS ANGELES • SEATTLE

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...and now... Westinghouse

SOCKET INSTRUMENTS

POWER AND MACHINE PERFORMANCE FACTS *Instantly!* AT NEW LOW COST!

As quickly and conveniently as you plug electrical appliances into convenience outlets in your home, you now can plug Westinghouse *instruments* into standard Type "S" meter sockets. These sockets, available for as little as $1.50, are easily and quickly installed in conduit on any circuit. Sockets are fully self-supporting—no expensive mounting accessories or supports are required.

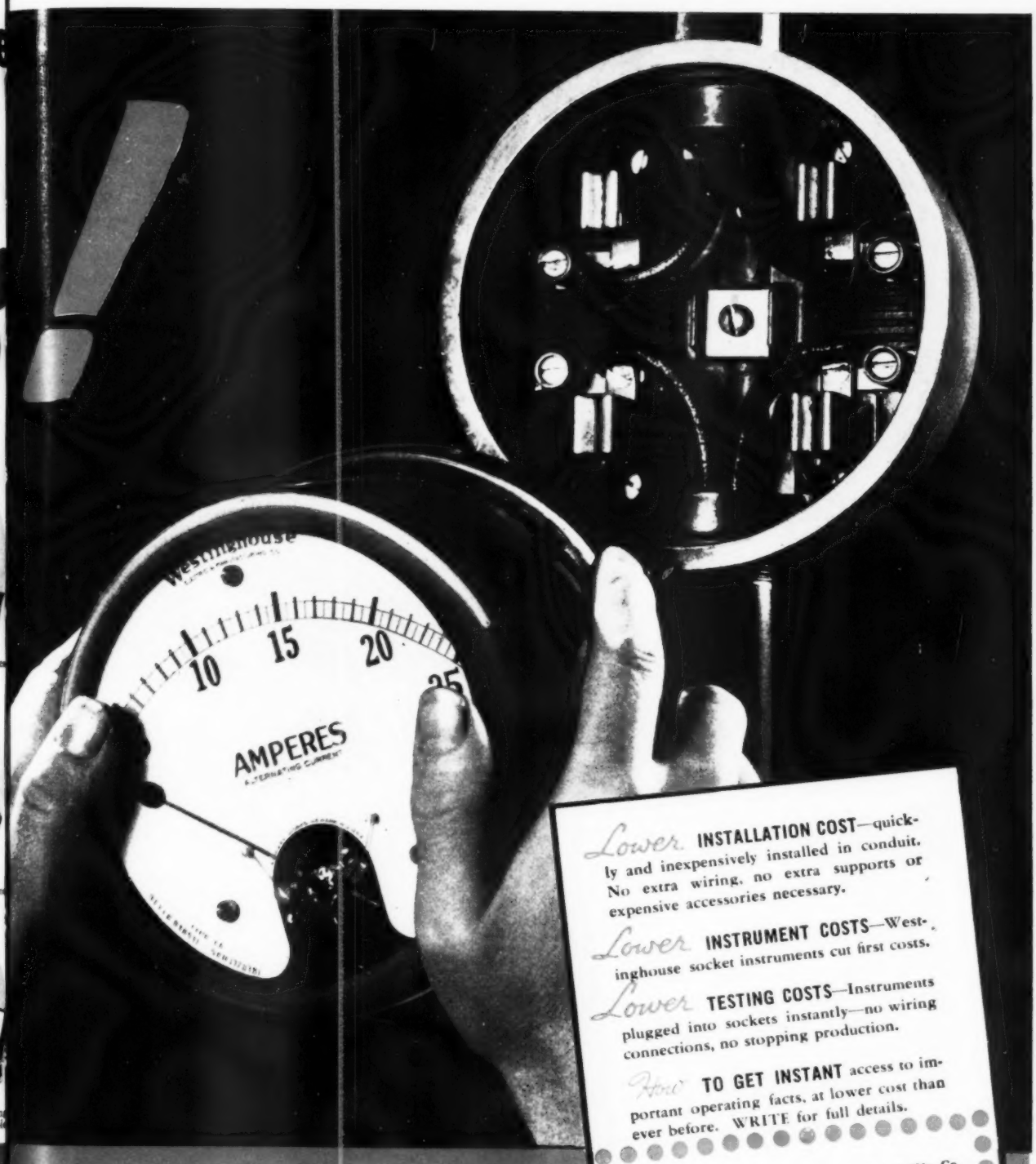
With these low cost sockets installed throughout your plants, wherever instrument readings are desired—for machine or process control, or for test or recording purposes—you can plug in *any* Westinghouse socket instrument at *any* time. No wiring connections to make. No lost man or machine hours. No wrong hook-ups—plug in an instrument and start taking readings in a minute or less!

A *complete* line of low cost socket instruments is available, built with the same careful design and workmanship that have marked Westinghouse instruments as the standard of accuracy for 50 years. Your Westinghouse or jobber representative will gladly give you complete information about this remarkable new instrument development.

Type "S" meter sockets are e
installed on *existing circuits.*

Install standard Type "S" m
sockets on *ALL new circuits.*

Handy Test Jack for connecting
analyzers, recorders, or portable



Lower **INSTALLATION COST**—quickly and inexpensively installed in conduit. No extra wiring, no extra supports or expensive accessories necessary.

Lower **INSTRUMENT COSTS**—Westinghouse socket instruments cut first costs.

Lower **TESTING COSTS**—Instruments plugged into sockets instantly—no wiring connections, no stopping production.

Also **TO GET INSTANT** access to important operating facts, at lower cost than ever before. WRITE for full details.

Westinghouse Elec. & Mfg. Co.
Dept. 7-N, East Pittsburgh, Pa.

Please send me complete information on Socket Instruments.

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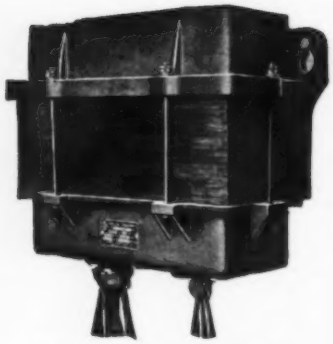
ELECTRICAL INSTRUMENTS
"The Standard of Accuracy Since 1888"

MODERN

Built to meet to-day's requirements . . .



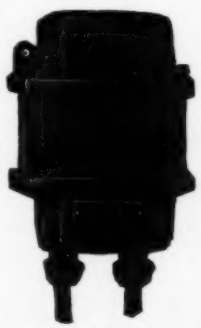
Type CFT, three-phase, outdoor type, air-cooled transformer.

CONSIDER the economy and convenience of AmerTran Type "CF" Air-Cooled Transformers whenever it is desired to obtain low-voltage power from higher voltage circuits. These moderately priced units are available in sizes up to 100 Kva. and for potentials up to 600 volts. They may be installed wherever they are needed—either indoors or outdoors*—without the necessity of oil, fireproof vaults or enclosures. They are also equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. These features mean low first cost and minimum installation and maintenance expense. May we send data on equipment to meet your needs?

* Units 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.



Type CF, single-phase, indoor type, air-cooled transformer.

AMERICAN TRANSFORMER COMPANY

178 Emmet St., Newark, N. J.

AMERTRAN TRANSFORMERS

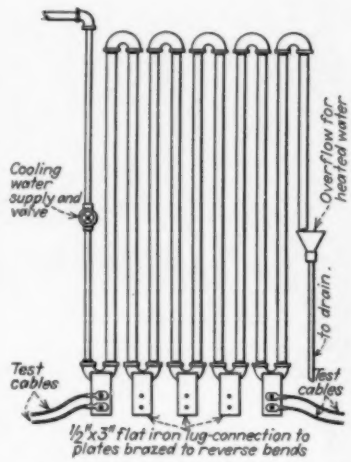
Manufactured Since 1901 at Newark, N. J.

Motor Shops

[FROM PAGE 60]

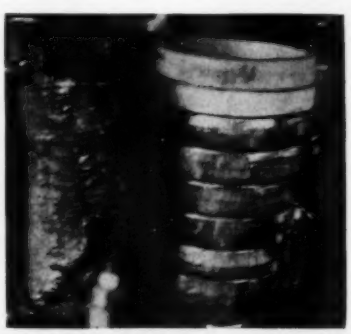
to them. Since each bottom coil end provides connections for cable leads, the amount of pipe resistance can be selected according to the size of generator being tested.

A cold water pipe connection and valve was provided at the left end of


Cooling water supply and valve
Overflow for heated water
to drain
Test cables
Test cables
½"x3" flat iron lug-connection to plates brazed to reverse bends

HEAVY TESTING — Water cooled coils of pipe provide artificial testing for plating generator.

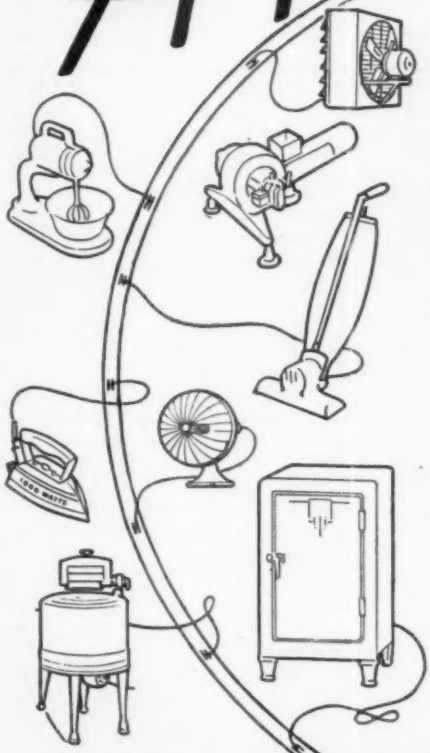
the coils. The cooling water is circulated to an open funnel and drain pipe at the opposite end. This allows vapor to be noticed and also escape when heavy current flow overheats the cooling facilities.



SHOOTING STAR—*In the Thomson Electrical Works, Ltd. of Montreal the transformer crews are busy getting out new coils for a* 150 *kva.,* 25,000/2200 *volt transformer from a large brick plant. The view shows a group of the windings that were destroyed when a secondary breakdown took place. Newly wound coils, some already varnished and baked, are stacked alongside the remains of what had once been a good winding.*

IF YOU SELL-SERVICE or INSTALL *Appliances*

You should know about this NEW device . . .



Eliminates many "false-alarm" service calls

Today we find motor-driven and heating appliances of all kinds on so-called lighting circuits.

This increased load has resulted in an increasing number of service calls — caused by the circuit fuses opening NEEDLESSLY when motors start.

Such calls are wasteful and costly to everybody. User loses time and temper and often money when service is stopped.

Service man is dragged away from more profitable work.

Contractor or dealer loses if user kicks about paying full cost of call when only work done was to replace a fuse.

The Fustat stops this senseless waste. Its long time-lag keeps it from popping out needlessly on motor-starting currents — yet it protects like a fuse against dangerous cord shorts, grounded sockets, etc.

Thus by using a 15 ampere Fustat, an ordinary circuit can be given SAFE protection without incurring a lot of useless shutdowns and "false-alarm" service calls.

And the Fustat does more — it . .

Prevents user being robbed of protection

Unlike ordinary fuses, the Fustat cannot be replaced with a penny or other such substitute for the fuse — or with a size too large to protect. In fact, sidetracking the Fustat in any way is practically impossible.

The Fustat protects the user against anyone unwittingly creating a fire or personal injury risk thru haphazard practices. Only a willful and deliberate attempt can destroy safe protection when a Fustat is used.

Makes for better business

Using Fustats for circuit protection is just good business — for what device other than the Fustat can permit adding more appliances to present circuits . . . yet positively stop user from overloading circuits . . . protect against dangerous cord shorts . . . eliminate needless blows and service interruptions and . . . make SAFE protection REMAIN SAFE

The Fustat fits present fuseholders

Thru the use of an inexpensive adapter, the Fustat fits any standard Edison base fuseholder. The adapter screws in like a fuse and locks in place. The Fustat may be changed in the regular manner.

On new jobs, when buying panels, switches, etc., you can specify that they be equipped with Fustat bases.

Retails at 7½c
In 15 to 30 amp. sizes

The FUSTAT

For full information write to any of these firms —

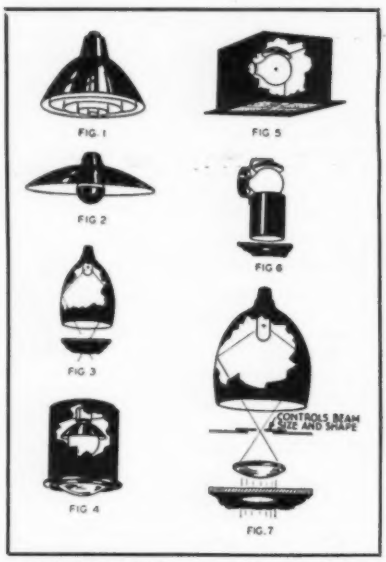
BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC CO., Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 277 Broadway, New York City

UMI

Better Lighting

DOWN-LIGHTING FOR THEATRES

To provide down lighting for auditoriums mount directional lighting units on or in the ceiling which throw beams of light over a definite seating area. Equipments for accomplishing this have



SEVEN WAYS to provide down lighting for theatre auditoriums when installed under trying conditions.

beam spreads ranging from 45° to 90° and the number of units needed is determined by this spread. With a 90 degree spread, for example, the effective floor area covered will be equal to the ceiling height. With a ceiling 20 feet high and a 40-foot width of theatre, 2 rows of units would be indicated. For a 20 per cent efficiency, approximately one-quarter watt per foot is necessary for a level of 1 footcandle.

The characteristics of available equipment are as follows:

Fig. 1. Louvered reflectors are equipped with spill shields, rings, or crossed fins, which cut off the direct light from the filament. For auditorium use, the louvers should be a dull black. Efficiency 30 per cent. Beam spread 30 degrees.

Fig. 2. Reflectors with silvered bowl lamps are suited to special lighting, decorative in itself, for beneath canopies and in lobbies. Efficiency approximately 50 per cent. Beam spread 30 degrees.

Fig. 3. Elliptical reflectors collect a large part of the light from a lamp and direct it back through a fairly small hole placed at the second or conjugate focus. Efficiency approximately 35 per cent. Beam spread 60 degrees. This system is suitable for auditorium use where small inconspicuous holes in the ceiling are desired.

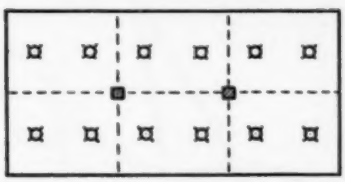
Fig. 4. Lens downlights with plano-convex lenses and spherical reflectors have a high lens brightness and should be used for high ceiling auditoriums or for special applications such as corridors. Efficiency approximately 15 per cent. Beam spread 5 to 20 degrees.

Fig. 5. Lens plate lighting has become a familiar method. It is suited to many special applications, but the lens brightness is rather high for auditoriums. Efficiency 20 per cent. Beam spread 5 to 30 degrees. By using a spread lens ,the beam can be elongated in one direction.

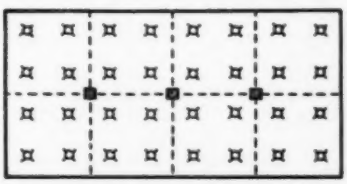
Fig. 6. Objective lens equipment provide good control and can be directed through small ceiling holes that are unobtrusive and well suited to auditorium lighting. Efficiency approximately 10 per cent. Beam spreads are obtainable up to 90 degrees.

Fig. 7. Elliptical reflectors with lenses are used to project light through holes which are unobtrusive and hence these equipments are well suited for auditorium lighting. Efficiency approximately 40 per cent. Beam spreads up to approximately 60 degrees. This system requires considerable space above the ceiling.

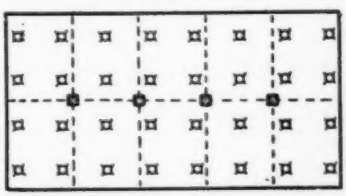
LAYOUTS THAT CONFORM WITH STRUCTURAL DESIGN



TWO UNITS PER BAY—Usually applicable only in narrow bays, where width is less than two-thirds length.



FOUR UNITS PER BAY—This is the most common system for the square bay of usual dimensions.



FOUR-TWO SYSTEM—Equivalent to three units per bay and alternative to four per bay where spacing allows.

TO REDUCE ERRORS—Errors in posting have been cut 50 per cent in the bookkeeping department of a branch office of the Integrity Trust Company, Philadelphia, Pa. They installed a new lighting system, consisting of four 500-watt Curtis indirect urns mounted on the walls. The light intensity is 26 foot-candles. Complaints of eye strain have stopped.

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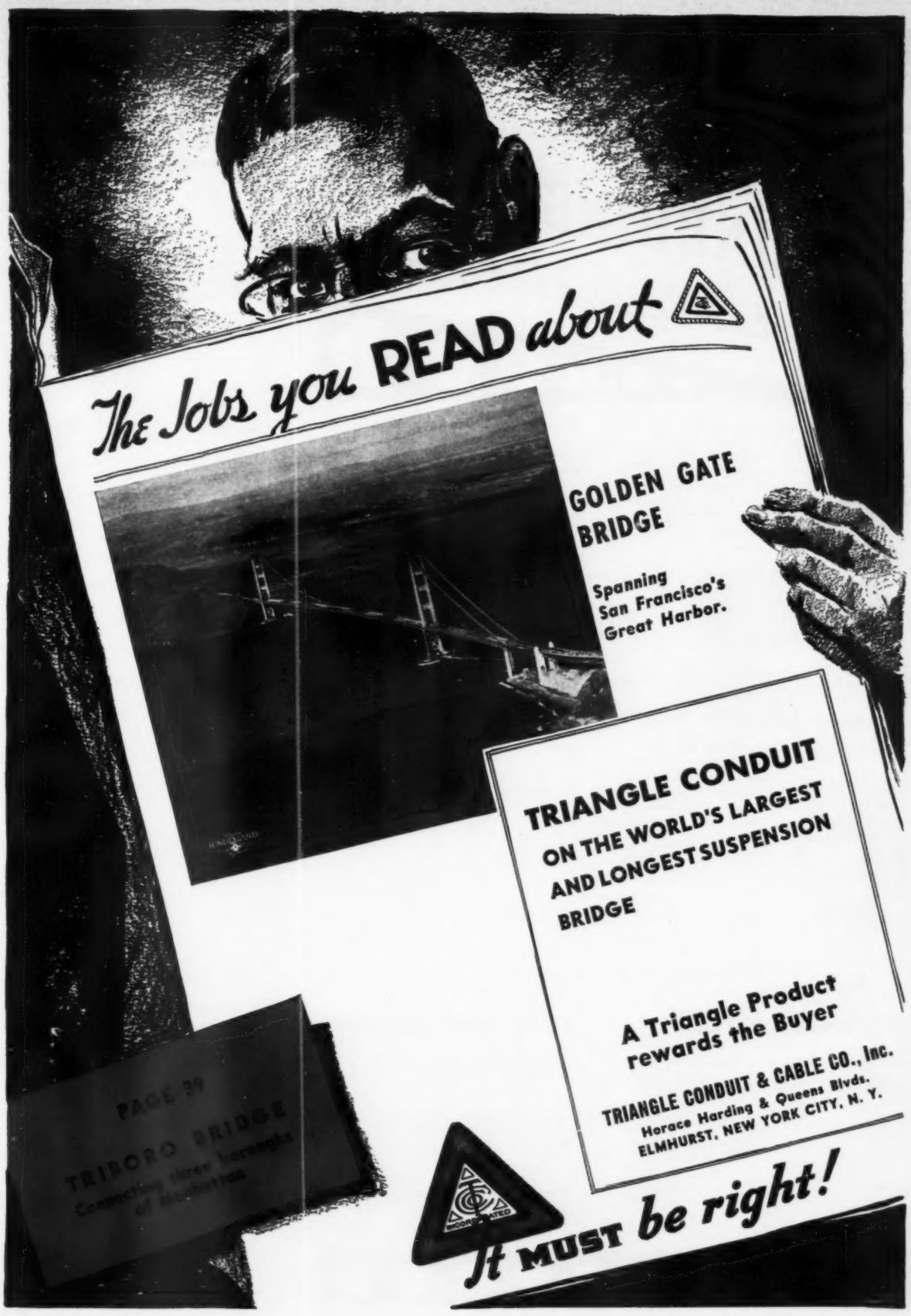
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A Triangle Product rewards the Buyer
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding & Queens Blvds.
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PAGE 39
TRIBORO BRIDGE
It MUST be right!

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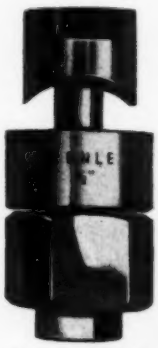
Announcing Something NEW for PUNCHING HOLES in Metal Boxes and Panels

New Cap Screw and Drive Nut for the ½" Knockout Punch

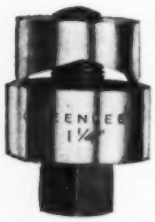
Greenlee Knockout Punches have always been efficient tools, even in the size for ½-inch conduit. However, in order to increase the length of service of the ½-inch punch in cutting ¾-inch holes in the heavier-gauge sheet metals, and to speed up the operation, a new driving arrangement has been designed for use with the standard punch and die. This consists of a cap screw with two threaded sections and a hexagon drive nut, as shown to the left.

The assembled unit is shown to the right. In this arrangement the small thread merely holds the punch in position, and the actual drive is by turning the nut on the larger threaded section. The advantages are that the speed of cutting is increased, and that this heavier thread is better able to resist the wearing action of the nut, when turned against the thrust of heavy punching.



½" Punch with the New Screw and Drive Nut

Greenlee Knockout Tools are Timesavers



Knockout Punches are made for all sizes of conduit from ½" to 2"

Greenlee Knockout Punches are time and labor-saving devices to a much greater extent than their simple appearance would indicate. They eliminate all reaming and filing in the enlargement of holes in metal boxes, etc., and they perform the operation in a fraction of the time required by old methods. They are put up in two sets for conduit from ½ to 1¼-inch and for 1½ and 2-inch conduit.

When holes larger than 2-inch are to be made, the Knockout Cutter, not illustrated here, is required. It is an adjustable tool for cutting holes for all sizes of conduit from 1½ to 3-inch. Like the punches, it handles the job of hole enlargement with speed and accuracy, leaving a hole that is smooth and round.

OTHER GREENLEE TIMESAVERS: Conduit Benders, Pipe Pushers, Ball-Bearing Joist Borers, Electrician's Bits, Bit Extensions.

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☐ *Knockout Cutters* ☐ *Conduit Benders* ☐ *Joist Borers*
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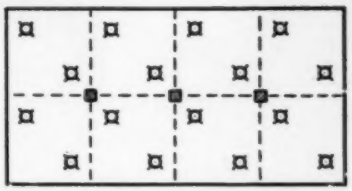
Name ..... *Address* .....

City ..... *State* .....

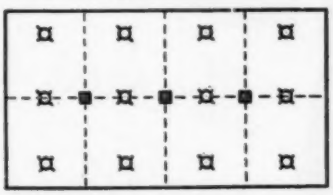
My Jobber is ..... EC 2-38

Better Lighting

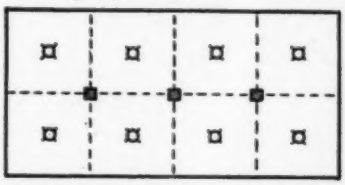
[FROM PAGE 66]



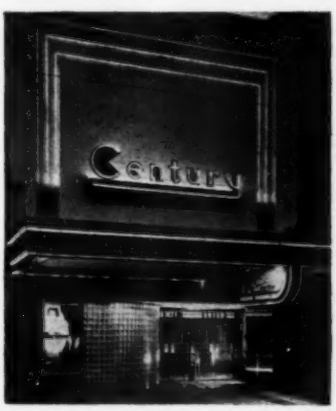
TWO UNITS PER BAY STAGGERED —Acceptable in larger interiors, where permissible spacing does not dictate four per bay. Less favorable appearance and certain areas near the walls may be inadequately lighted.



INTERSPACED LAYOUT — Applicable in rectangular bays but suited only where the center row will not interfere with future structural changes, such as added office partitions.



ONE UNIT PER BAY — Satisfactory only where the bay size is no greater than the maximum allowable spacing—an unusual condition except in high ceilinged rooms.



LIGHTING SCHEME — A gold, and dark and light green neon-tube lighting, combined with high-intensity incandescent lamps, attracts patrons to the Century Theatre in Mobile, Ala., a modern, air-conditioned show house. The marquise and sign is outlined with a double row of light green neon tubing, and 75-watt lamps are staggered on 36-in. centers, recessed in a metal trough under and around the marquise edge.

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Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Range against a Wall

Q. "Can an electric range be placed against a wood-lath-and-plaster-wall or against a wood partition?—J. E. G."

A. Rule 4232 (1937 Code) requires that ample space or other protective means be provided between a range and adjacent combustible material. But it gives no exact measurements. There are National Board regulations covering coal, wood, and gas ranges, wherein 6 inches of air space or other protection is required. The American Gas Association, in testing gas ranges, tests them at a distance of 6 inches from combustible material.

While there is no exact space measurement given in the National Electrical Code, the Underwriters' Laboratories, in testing electric ranges, place them against a piece of soft pine and no point on the board must attain a temperature in excess of 90° C. or the range is rejected.

Where a range is tested in this manner and approved, there would seem to be no hazard presented when the range is placed and used against a wall or wood partition. Nor can any rules be located which would prohibit such an installation.

"T" Rated Switches

One of our reader friends has taken us over the coals for not giving a full definition of a "T" rated switch in our answers to Code questions in the November issue.

Well, here is an attempt:—

A. "T" rated switch is one which will successfully close without harm to itself, on a tungsten lamp load equivalent to the 125 volt rating of the switch and will continue to do so without harm to itself for 6000 cycles. Such a switch must be capable of closing a circuit having a momentary inrush of approximately 800 per cent of the normal current of the circuit.

Balance

Q. "What is the difference if the circuits happen to be even or odd numbers or evenly or unevenly divided at the distribution cabinet?"—A. C. B.

A. This refers to the third sentence of Section 2113, which requires that the same number of circuits shall, as nearly as possible, be connected to each side of the neutral. In this case the Code desires that as near a balance as is possible be maintained. The only difference is that the wrong way throws the system out of balance and puts more load on the common neutral.

***NORTHWESTERNERS COOPERATING**—A sincere desire to cooperate has prevailed ever since the NECA convention delegates toured the northwestern cities, reports R. H. Montgomery, president of the Portland, Ore., Chapter of NECA. The City's Code Committee meets twice a week with good attendance, in the work of revising Portland's Electrical Code. Mr. Montgomery is also interested in an apprenticeship training course now being conducted in conjunction with the city's educational department.*

What Does the Label Mean?

Q. "I have installed the wiring and connected up the motor of an oil burner which has been labelled as approved by Underwriters' Laboratories. Yet the local inspector has given me a violation and tells me that I must provide a fuse or some sort of over-current device and must connect it in the motor leads so that the protective device carries nothing but the motor, not even the control transformer nor the ignition transformer. Now, that means, that I have got to undo some of the connections made by the oil burner manufacturer. I thought that all of his material and connections had been approved by the Laboratories. Is the inspector right in making me insert this device in the burner manufacturer's equipment? If I do, does that affect the Laboratories' approval in any way?"—A. D. A.

A. The National Electrical Code in rule 4322-c (1937) [or 808-c, Exception 1, of 1935] requires that an automatically started motor of ⅛ to 1 hp. be provided with either an inherent overheating protective device or an over-current protective device, rated at not over 140 per cent of the motor ampere rating.

Underwriters' Laboratories advise that the protection of the motor is an installation problem and is therefore not provided by the oil burner manufacturer. This being so, the inspector is perfectly right in requiring that the installing contractor provide the protection required.

In order to maintain an over-current protective device in the circuit at not over 140 per cent of the motor rating, it is necessary to connect it in so that it controls the motor only. Placing it where it also has to carry the control and ignition transformer will cause it to open the circuit or require that it be of over 140 per cent of the motor rating. Also it has been found that over-current devices for this purpose have to be of the time lag or thermal type.

It certainly does seem as though the burner manufacturer should provide a place on the motor or its terminal housing to accommodate the protective device, if he does not himself provide the protective device for the motor and have it included in the Laboratories' approval, should also leave the motor circuit open so that the installing contractor does not have to undo any of the manufacturer's work. We hope that this manufacturer and the Laboratories will soon get together, so that the burner will be complete when it receives the Laboratories' label.

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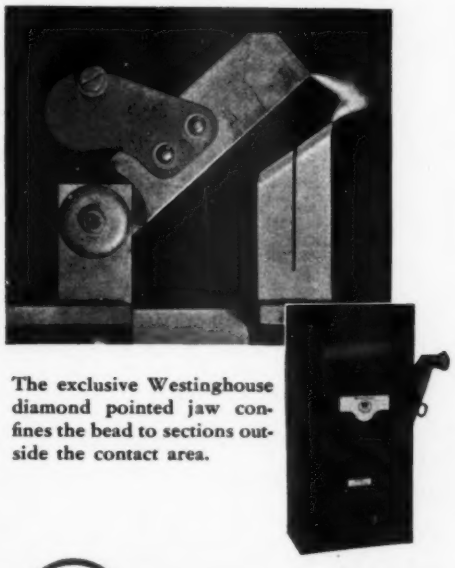
THERE'S A SWITCH WE NEVER HAVE TO BOTHER WITH, JOE!
YOU SAID IT BOSS! THESE WESTINGHOUSE SAFETY SWITCHES SURE STAND UP AND TAKE IT. YOU DONT HAVE TO NURSE THEM ALONG



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Your customers won't complain about dressing down jaws and blades to keep contacts tight and cool, when you install Westinghouse Safety Switches. Jaws are diamond-shaped. When contact is broken, the arc is drawn between the diamond point of the break jaw and the *end* of the blade. The sections that carry current cannot pit, bead or burn off.

In addition, one-piece copper parts prevent heating from loose connections. And in the 575 and 600-volt types "De-ion" Grids quench heavy arcs almost instantly.

Simplicity of construction, well-spaced knockouts and ample room for wiring reduce your wiring costs. All commercial types and ratings available from your electrical wholesaler.

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The Duplex Dome illuminates the upper walls and ceiling with diffused light and delivers direct light downward. Louvers formed in the metal walls of the reflectors divert sufficient light upward to relieve unpleasant contrast between the bright reflector and dark background. The white porcelain enameled exterior of the reflector and supporting stem are also illuminated.

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Questions on the Code

[FROM PAGE 70]

The 1937 Code also provides a third method of protection for these motors in rule 4322-c, 3, where the motor is part of an *approved assembly* which is equipped with other safety combustion controls. Note the italicized words above which indicate that the Laboratories' approval will have to include the combustion controls if the 140 per cent over-current protection is omitted and the whole affair afforded only the protection of a 15 ampere branch circuit fuse. Some inspection departments have already served notice that they will not accept sub paragraph 3 of 4322-c until this method is mentioned on the label.

Outlets on Circuit

Q. *"In wiring a store and providing 10 amp. duplex receptacles at the outlets to supply lamps for display purposes, how many outlets or how many receptacles can be placed on a circuit?*—G. E. N."

A. As our correspondent desires to use 10 amp. receptacles, he is restricted to the use of the 15 amp. branch circuit described in rules 2126 to 2125 inclusive. And with the use of this circuit he is restricted, by 2124, to a total load of 15 amps. and by 2123 to a fuse (or circuit breaker) of not over 15 amp. capacity.

By rule 2107-b, we find that the load for each outlet, when not supplying fixed appliances (and in this case portable lamps are being supplied), the load on the circuit is to be determined on the basis of 1½ amps. per outlet. Therefore, in this case the number of outlets is limited to 10, (10 x 1½ lamps = 15 amps) which with the use of duplex receptacles will provide 20 receptacles.

Double Fusing

Q. *"Under what conditions does one use fuses in both wires of a branch lighting circuit? Is it in non-polarized systems?"*—A. C. B.

A. Fuses are required in both wires of circuits derived from systems which do not have grounded conductors. In such systems polarizing is not possible.

NEW COMPACT OUTLET SOLVES RESTRICTED SPACE PROBLEM

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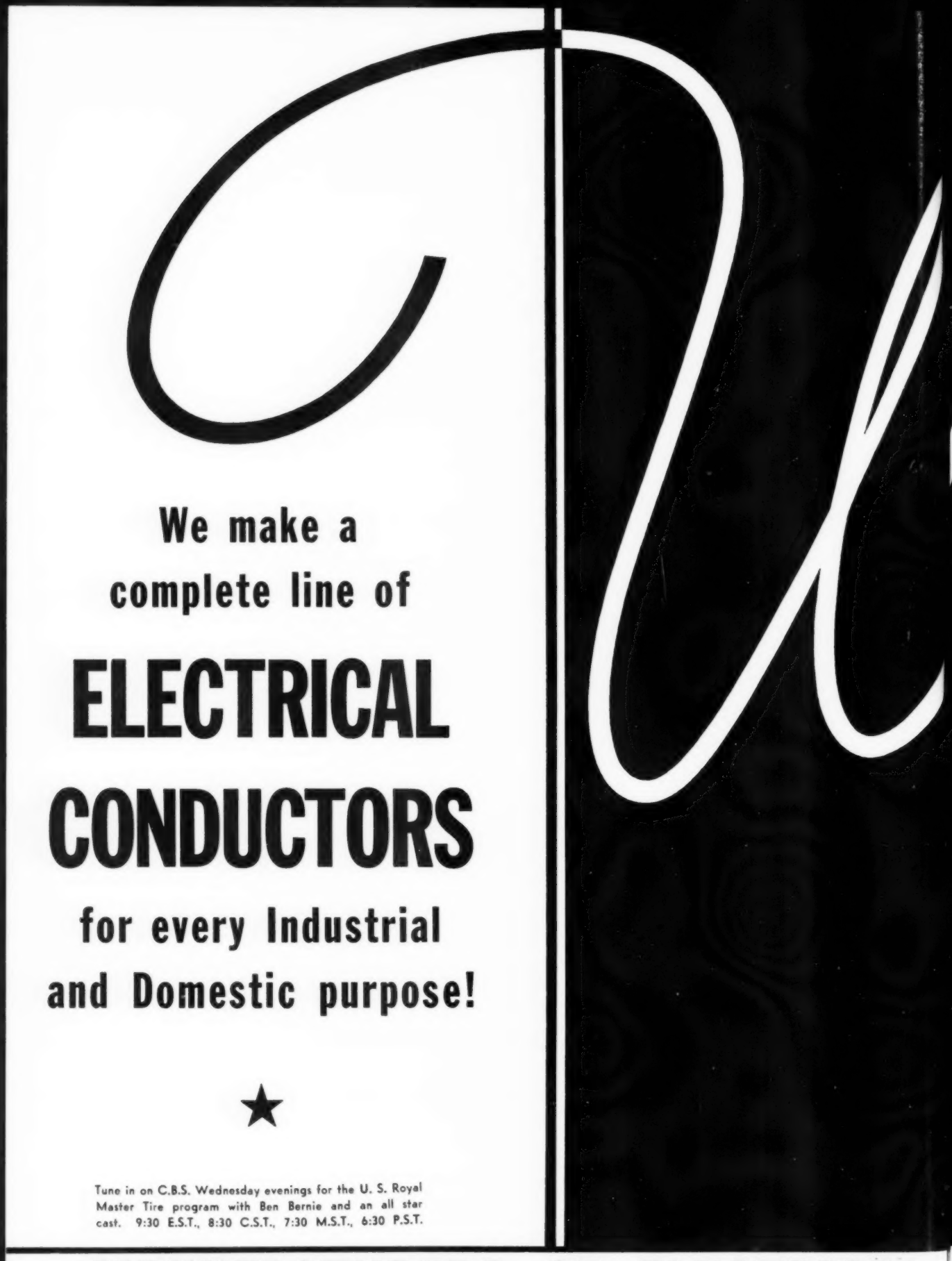
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Questions ON Signalling

Answered by
ALBERT A. SCHUHLER

Function of Impedance Coil

Q. *Of what value is an impedance coil when used in an intercommunicating telephone system? What are its characteristics?* — W.F.

A. The function of an impedance or retardation coil is: first, to prevent the high-frequency voice currents from passing through the telephone receiver; second, to prevent cross-talk or interference, when more than one conversation is being carried on at a time in the same system; third, to regulate the supply of current to the transmitter of the various telephones. Coils of this type have a large amount of self-induction and oppose or prevent the current from maintaining a maximum value at the same time that a maximum pressure is present, thus causing a choke effort.

Direct current will readily flow through an impedance coil. Alternating current will not. Therefore, when an impedance coil is used in conjunction with a condenser, the direct current may be automatically separated from the high-frequency voice currents or ringing current.

The omission and incorrect connection of impedance coils in systems requiring them, is the source of considerable trouble in intercommunicating telephone systems. Manufacturers' diagrams, therefore, should be thoroughly studied and impedance coils connected properly.

Any Point Call

Q. *Please show wiring diagram of a bell system which will consist of three stations, each having a bell and a push button. All bells except the one at the calling station are to operate in parallel.* — N.L.

A. The accompanying diagram shows the type of system desired. The push buttons are of the return-call or double contact type. The system is arranged so that the first button operates bells No. 2 and No. 3. The second button operates bells No. 1 and No. 3. And the third button operates No. 1 and No. 2.

This type of system is generally for intercommunicating purposes. But it may be used for special signalling.

Signal for Hot Water System

Q. *Is there any method whereby a signal may be given should a hot water heating system reach a dangerous temperature?* — L.B.

A. A device known as an aquastat may be inserted in the boiler and connected to a standard open or closed-circuit signal system. An aquastat is designed to actuate a set of contacts in the event that the water temperature exceeds 200 deg. Fahrenheit.

If this equipment is to be used on a large heating system it is advisable to consider a supervised signal system in connection with this protective device.

Overheated Furnace Alarm

Q. *A simple alarm is desired which will give warning of excessive temperature at the furnace in a residence. What inexpensive system may be obtained for this purpose?*—E.W.

A. The simplest system employs one or more thermostatic detector units. Each unit is designed to protect an area of 225 square feet or a space 15 ft. x 15 ft. These units are mounted on the ceiling and should be located above and also at points near the furnace. Each unit is adjusted to a fixed temperature, the 165 deg. F. type being preferred for this type of work.

The system employs open-circuit wiring similar to a door bell system, to include the thermostatic units, bell, test button, and a source of current. The test button should be connected in multiple with the detector units for making tests at frequent intervals.

While this system is often used, it is a non-supervised system, therefore subject to failure without the knowledge of the users. A supervised system should be given consideration for proper protection.

Dining Room Calling Devices

Q. *What devices are found to be best adapted for originating calls from a dining room?* — F.G.

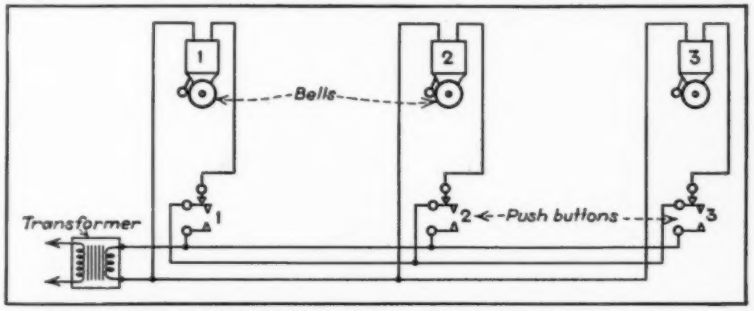
A. Several types of contacting devices are available for making calls from a dining room. The selection of the device would be based upon the method of operation.

For operation by foot at one designated location only, use a floor push to fit into the wood flooring or on a standard floor box. It may be more convenient to use a combination floor push with flexible cable and floor tread. The cable may be provided in any length so that the floor tread can be shifted to any point below the dining room table.

For operation by hand, there are types of combination floor pushes with longer flexible cable to reach to the top of the table. The most common hand operated calling devices are the pear push, the combination push button and table clamp or the directory push.

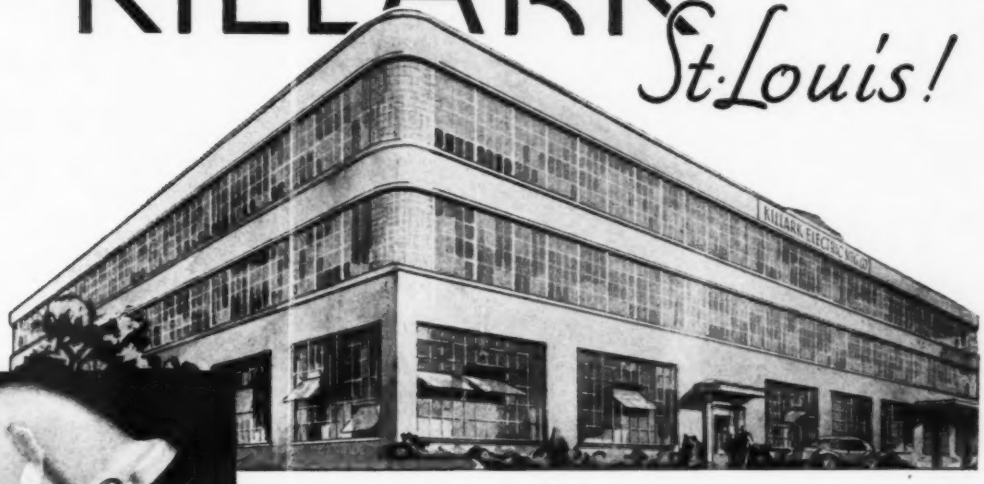
Fire Alarm Door-Openers

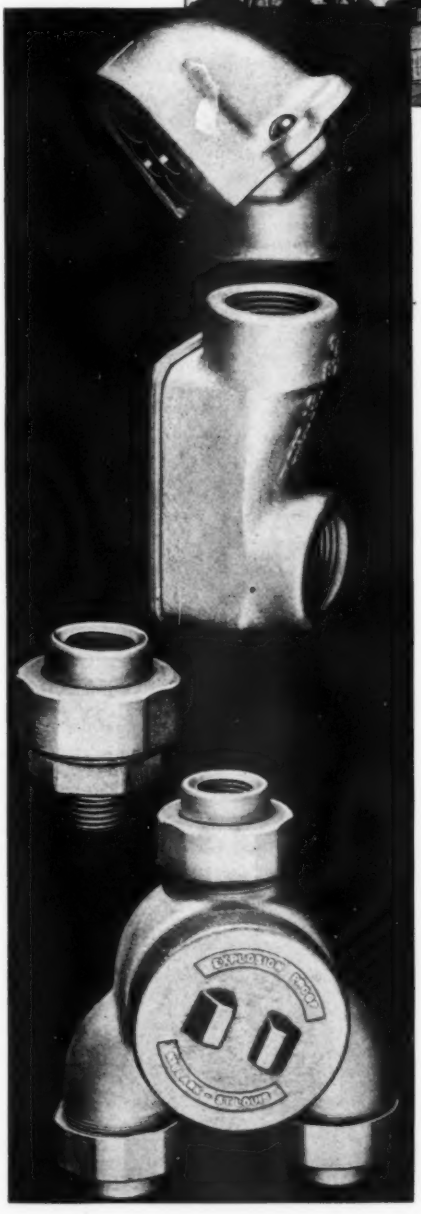
Q. *Is it possible to release certain doors leading to the outside of a building in the event a fire alarm sys-*



FROM ANY POINT—Wiring hook up assigned for calling several other stations from predetermined points.

KILLARK *St. Louis!*





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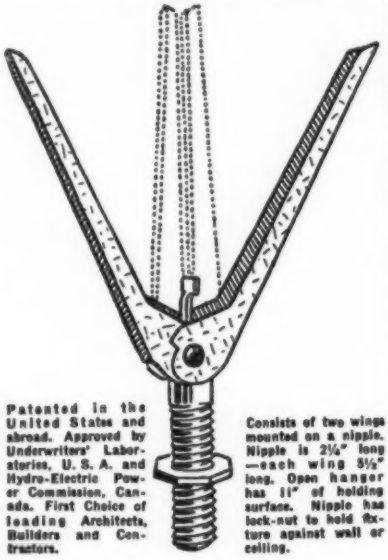
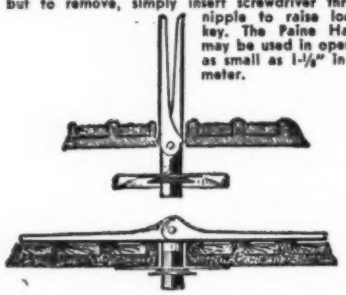


Patented in the United States and abroad. Approved by Underwriters' Laboratories, U. S. A. and Hydro-Electric Power Commission, Canada. First Choice of leading Architects, Builders and Contractors.

Consists of two wings mounted on a nipple. Nipple is 2¼" long —each wing 3½" long. Open hanger has 11" of holding surface. Nipple has lock-nut to hold fixture against wall or ceiling.

all around ease of use and ruggedness

The Paine Hanger is the secure, easy-to-use and most satisfactory device for attaching outlet boxes, ceiling fans and numerous other fixtures. When wings are through the hole, they lock automatically; but to remove, simply insert screwdriver through nipple to raise locking key. The Paine Hanger may be used in openings as small as 1-1/8" in diameter.



By attaching the article to be hung to the hanger before inserting hanger in wall or ceiling, much overhead work and working time is eliminated.

PAINE COMPANY
2947 Carroll Ave.
CHICAGO
79 Barclay St., New York

Questions on Signaling

[FROM PAGE 76]

tem is operated? Can such door-openers be supplied for normal closed-circuit work? — B.K.

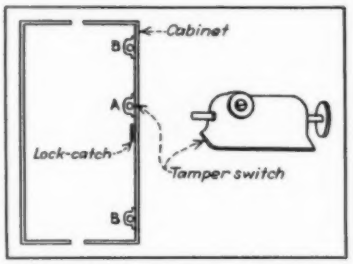
A. It is possible to release doors by operating a fire alarm system, in fact, some systems of this type are in operation. Door-openers furnished for normal closed-circuit operation in such systems, however, must be made to order to meet the requirements. This part of the system should be included and be engineered by the manufacturer of the fire alarm equipment.

Tamper Protection for Cabinets

Q. *Several of our control and battery cabinets require protection against unauthorized persons. Some difficulty has been experienced in this respect, and now we want an alarm to signal when these cabinets are opened.*

What simple method may be applied to this problem and what wiring is necessary?—H.C.

A. The use of tamper springs is found to be satisfactory for the protection of cabinets. These springs are located on the inside of each cabinet. For small cabinets having hinged doors, the spring may be placed next to the lock-catch, as shown at A, in the following drawing. For larger cabinets of this type two springs may be placed as shown at B. For cabinets having screwed-on covers, one spring should be placed in each corner.



TELL-TALE GADGET — Under-cover contact spring closes alarm if cabinet lid is opened.

The drawing of the tamper spring is shown in the illustration and consists chiefly of a plunger which actuates contacts inside of its housing. A closed-circuit type should be used.

The method of wiring would be the same as for a simple closed-circuit burglar alarm system, in which the tamper springs would be connected in series, with the coil of a locking relay. The contacts of the relay would close the circuit to the audible signal.

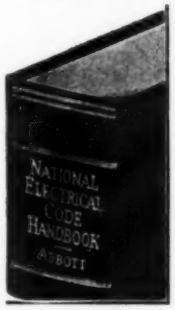
Just Out!

New 1937 Edition

NATIONAL ELECTRICAL CODE HANDBOOK

by ARTHUR L. ABBOTT

***Fourth Edition*, 563 *pages*, $3.00**



The 1937 National Electrical Code is a new code, entirely new in arrangement, more than 50 per cent new in wording, contains important new rules.

Abbott's Code Handbook has been completely rewritten to correspond with the new 1937 edition of the Code.

Save time and trouble in getting a command of these new features of the 1937 Code.

Branch Circuits—Now classified according to fuse rating or circuit breaker setting as 15-, 20-, 25-, 35-, and 50-amp. circuits. House wiring circuits depend upon floor area, regardless of number of outlets.

Appliances—Five special types of circuits specified.

Feeders—Standard loads for some occupancies considerably increased. For ranges of 3,500 watts or higher rating, new demand factors apply to feeders.

Panel boards—Important change made in requirement for over-current protection.

Services—New rules governing number of sets of service entrance conductors to one building and number of switches and fuses, or circuit breakers, for control and protection of each service.

Motors—Rules formerly appearing in old Articles 8 and 10 now consolidated in one article; so changed in wording and arrangement that they must be studied carefully to find what changes have been made.

Get to the root of these important changes, new rules and cautions, quickly, with Abbott's NATIONAL ELECTRICAL CODE HANDBOOK. Have this helpful explanation of all code rules constantly at hand. Mail the coupon today.

McGRAW-HILL ON-APPROVAL COUPON

McGraw-Hill Book Company Inc.
330 W. 42nd St., New York, N. Y.

Send me Abbott's National Electrical Code Handbook for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

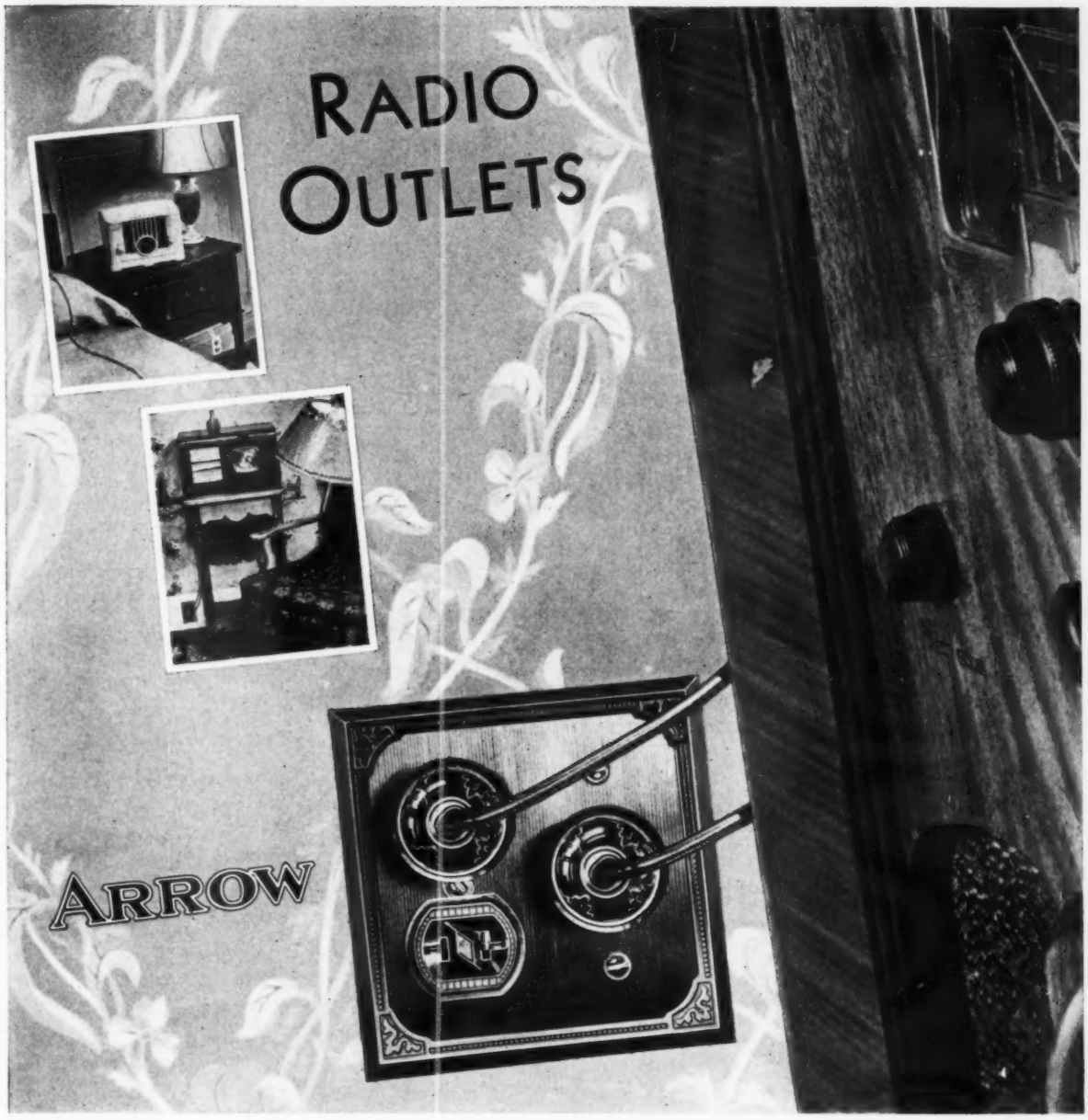
Address .....

City and State .....

Position .....

Company .....E.C. 2-38

(Books sent on approval in U. S. and Canada only.)



This neat hook-up for radio connections provides for Aerial, Ground and Power connections from a one-gang outlet. Or in 2-gang type (first above) with extra opening for appliances. As easily installed as any convenience outlet; fits any standard-depth wall box. Gets rid of straggling surface wires; serves equally well for old buildings or new work; *completes* the electrical conveniences. Aerial, Ground and Power connections are plainly indicated on receptacle. The aerial and ground plug has blades set at angle to prevent insertion in the power slots. Receptacles and plates come in brown Bakelite and cream-tinted white IVORYLITE. (These units are designed for separate aerials. For 2-to-20 outlets from *one* aerial, use the Multicoupler Antenna System — instruction-sheets on request).

SOLD THROUGH YOUR **ARROW ELECTRIC DIVISION** ELECTRICAL WHOLESALER
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

UMI

In the News

N.I.S.A. MOTOR EXCHANGE PLAN

By action recently taken at an executive board meeting held in Chicago, members of N.I.S.A. may now sign up for participation in the activities of the N.I.S.A. Rebuilt Motor Exchange Bureau. Under this plan, those members having surplus equipment for sale, may list it with other member firms through the Bureau's centralized listing and filing facilities, located at 1349 Bauwans Street, Chicago, Ill.

To bring this plan into operation, sixty or more members are needed. Initiation fees are set at $50 per member to cover the cost of filing equipment, compiling cards, etc. A regular service fee of $2.50 per month will be charged after the initial records are supplied.

Listings are to include standard motors 5 h.p. and above; motors of any size, 900 rpm. and below; all special motors and generators, including prime movers, and auxiliary electrical equipment with a selling price of $100 or more. Each participating member is to receive a complete list of names and addresses of other participating members, also separate cards covering the various items of equipment listed for sale by all members. Likewise the member receives 50 blank cards for listing his own equipment with the Bureau, from which the Bureau prepares the necessary number of cards to send to all other members. A system of card cancellation for listings, which later become sold is a part of the Bureau's service.

There are detailed rules and regulations which define: ownership of listed equipment, requirements as to statements of condition and guarantees of equipment, responsibility of the Bureau or N.I.S.A., and terms and discounts recommended for all transactions.

ELECTRICAL HOME WINNERS

The essay contest on the "Electrical Standard of Living" sponsored by General Electric and cooperating utilities was won by Mrs. C. W. Smith of Clayton, Ga. and Prof. A. M. Brant of Ohio State University. Each one will receive a new completely electrified home.

They wrote the best answer to the question—Why does the electrical way of living appeal to me? The contest ran for a period of ten weeks and more than 275,000 persons entered. In addition to the two large prizes, the writers of 100 other letters received a share in $20,000 worth of appliances.

The award committee consisted of Faith Baldwin, author; Eloise Davison, New York Herald-Tribune Home Institute Director; Howard Ehrlich, executive vice-president of McGraw-Hill Publishing Co.; Charles Kellogg, president of the Edison Electric Institute and Mrs. Andrew J. Noe, president of the New York Federation of Women's Clubs.

Labor Union Responsibility

Electrical contractors should not count on the Federal Government doing something to impose responsibility on labor unions, despite the President taking that position in his address to Congress. In fact, the President himself sidled away from any thought of immediate action shortly thereafter, in response to questions from newspaper men. He said then he thought the unions should be given a chance to work out the problem first.

Nor is there any disposition to modify the Wagner Labor Relations Act. No such germ is sprouting in Congress, and there is no disposition to cultivate it inside the Administration. In fact, the best slant on the picture is that given by William Green, president of the American Federation of Labor. He opposes administration of the proposed wage-hour law by any board the President might appoint, because of his conviction that such a board would favor the CIO!

From CARTER FIELD
Washington Bureau
McGraw-Hill Publications

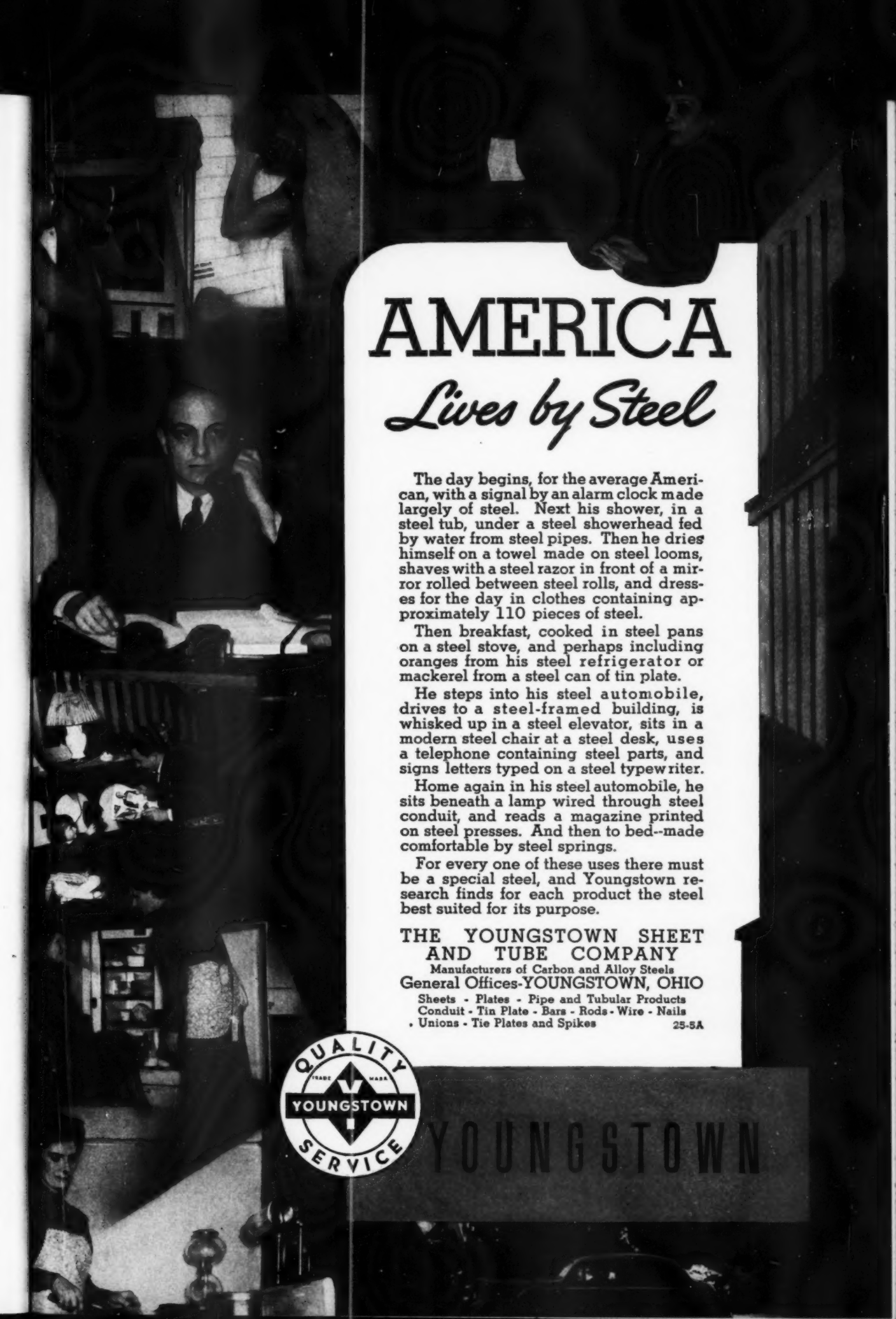
—What you got your deer horns down there for? —Oh, that's John's double socket jungle. He's getting square with the landlord for having only one outlet.

COMMERCIAL COOKING IN PHILADELPHIA

A large number of contractors and contractor-dealers in the Philadelphia territory turned out for a recent meeting to learn about the profit possibilities in electric cooking equipment. Opportunities for participation under national and local campaigns now moving were explained under the sponsorship of the Commercial Electrical Cooking Division of the Electrical Association.

NEMA INJUNCTION SUIT CONTINUES

Since opening on October 14, 1937, about 75 persons have been on the witness stand in connection with hearings being conducted on the suit brought by NEMA and 14 manufacturers of electrical equipment against Local 3, I.B.E.W. Charging violation of the Sherman Anti-Trust Law, and asking an injunction, the plaintiffs



AMERICA
Lives by Steel

The day begins, for the average American, with a signal by an alarm clock made largely of steel. Next his shower, in a steel tub, under a steel showerhead fed by water from steel pipes. Then he dries himself on a towel made on steel looms, shaves with a steel razor in front of a mirror rolled between steel rolls, and dresses for the day in clothes containing approximately 110 pieces of steel.

Then breakfast, cooked in steel pans on a steel stove, and perhaps including oranges from his steel refrigerator or mackerel from a steel can of tin plate.

He steps into his steel automobile, drives to a steel-framed building, is whisked up in a steel elevator, sits in a modern steel chair at a steel desk, uses a telephone containing steel parts, and signs letters typed on a steel typewriter.

Home again in his steel automobile, he sits beneath a lamp wired through steel conduit, and reads a magazine printed on steel presses. And then to bed--made comfortable by steel springs.

For every one of these uses there must be a special steel, and Youngstown research finds for each product the steel best suited for its purpose.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices-YOUNGSTOWN, OHIO

Sheets - Plates - Pipe and Tubular Products
Conduit - Tin Plate - Bars - Rods - Wire - Nails
Unions - Tie Plates and Spikes

25-5A

QUALITY TRADE MARK YOUNGSTOWN SERVICE

YOUNGSTOWN

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A chap called John Hancock McGuire
Connected some cables and wire.
He accomplished his aim
Without solder or flame
And his profits rose higher and higher.

BURNDY T-CONNECTOR — type QT—a sturdy, compact connector for wire or cable. High pressure contacts enforced by large-diameter studs and nuts; same wrench setting operates both nuts. Supplied for all combinations of cables from #8 to 2000 Mcm.

BURNDY

ENGINEERING COMPANY, INC. · 459 E. 133d ST., NEW YORK, N.Y.

★ LIGHT *the Job* WITH *Localite* ★

Specialized Engineered UNITS FOR EVERY LOCALIZED LIGHTING NEED ★

BETTER "SEEING" ON THE JOB

FLEXIBLE Fostoria LOCALITE

NEW CANOPY LOCALITE *Increases* WORKER'S EFFICIENCY

High Intensity Glareless Lighting Units Installed at Low Cost . . .

Clear illumination, without glare, over large working areas is obtained by the modern design of Fostoria Canopy type Localites. Wherever good seeing on a worker's task is essential to accuracy, speed and freedom from eye fatigue, Fostoria saves time, waste and money. Installation cost is surprisingly low. Production improvement is immediately apparent. We invite your test . . . . A complete variety of Localite models are available for specific applications. Write for information, today.

THE FOSTORIA PRESSED STEEL CORP., FOSTORIA, O.

DESCRIPTIVE BROCHURE FREE . . A valuable handbook of localized lighting.

In the News

[FROM PAGE 81]

have called witnesses including union officials, journeyman electricians, electrical, plumbing and building contractors, representatives of manufacturers and others. Hearings are being held on Tuesday, Thursday and Friday of each week in the offices of counsel for Local 3, before a special master appointed by a judge of the Federal Courts.

COMING MEETINGS

Wisconsin State Electrical Contractors' Association—Lorrain Hotel, Madison, Wisconsin, February 6, 7, and 8

National Electrical Manufacturers Association—Waldorf-Astoria, New York City, February 7-11

Minnesota Electrical Council—Minneapolis, Minn., February 14 to 17th inc.

Florida Association of Electrical Contractors and Dealers—San Juan Hotel, Orlando, Fla., February 21-23

National Fire Protection Association—Atlantic City, N. J., May 9-13.

National Electrical Manufacturers Association—Spring Conference, The Homestead, Hot Springs, Va., May 15-20

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 22-26

REQUIREMENTS SET FOR JUDGING NON-TAMPERABLE FUSES

Underwriters' Laboratories recently sent out a detailed outline of methods proposed for judging the type and design of non-tamperable fuses. This action is the outcome of views expressed at a public hearing on this subject.

Non-tamperability studies have been outlined to cover—

1. Whether some part or parts can be bent, removed, or otherwise altered to bridge the fuse and adapter in a cutout base.
2. Whether a coin, wire or other material can be used to bridge the fuse.

Other detailed rules for attempted bridging studies specify what common tools might be used, the mounting of fuse boxes, the amount of current carrying capacity before bridging is actually accomplished, and other methods of determination.

LEADING ENGINEER DISCUSSES WIRING

Howard E. Murphy, of the Stone & Webster Engineering Corporation, hit the nail on the head in recent informal talks on adequate wiring before several New England electrical groups. He cited the higher lighting standards for both commercial and industrial service, and rising power requirements to indicate a trend toward greater need for reserve capacity in wiring. Neither good engineering nor alert salesmanship can afford to overlook it, he said.

Mr. Murphy predicted the present 15-ft. candles intensity in many offices will soon

1..2..3..4..5..6

Remove the fuse, the end caps, and the link. Insert a new link, replace the end caps, and the fuse. THAT'S ALL, WITH A SHUR-LAG RENEWABLE FERRULE-TYPE FUSE, and you're in circuit again. There are no costly shut-downs, with men and machinery idle.

There is PLENTY OF ROOM to replace the link, and PLENTY to get it out. And in addition, SHUR-LAG links are of UNIFORM THICKNESS THROUGHOUT THEIR LENGTH. When a link blows, you can still get it out instantly and easily.

Minimum number of parts; sturdiest construction; easiest and speediest renewal; proper time-lag to prevent needless blowing, yet to forestall damage, immediate or cumulative. The utmost in economy, service and protection — and the price is no higher.

SHAWMUT S SHUR-LAG

RENEWABLE FUSES

Approved by Underwriters' Laboratories

The **CHASE-SHAWMUT COMPANY • NEWBURYPORT • MASSACHUSETTS**

Fuse makers since 1893

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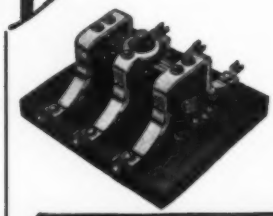
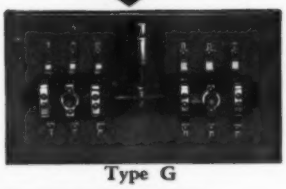
DIAMOND H TRADE MARK

A TRADE MARK THAT
MEANS SOMETHING!
—*for Instance*
REMOTE CONTROL
SWITCHES
for all kinds of Lighting Circuits

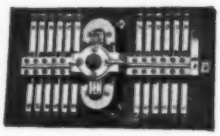




Type G

The Modern Electrical Contractor when faced with simple and easy control of hundreds or thousands of lights, recommends "Diamond H" Remote Control because he knows that it is dependable and will not fail. By a flip of the finger, lights are lit. That's the Modern way.

The three switches illustrated cover every important type of control job you may get.



Type H

If you wish complete data about these switches just ask for Bulletin 10-C.

The HART MFG. CO., Hartford, Conn.

Central
RIGID STEEL
CONDUIT
Protects
MANY OF THE NATION'S
OUTSTANDING BUILDINGS

Sheathing the vital electrical arteries of such buildings as the Waldorf-Astoria Hotel of N.Y., the Fisher Building of Detroit, the Gulf Building of Pittsburgh and hundreds of similar outstanding institutions throughout the country, Central Rigid Steel Conduit measures up to the highest standards of installation and service. Every length bears the Underwriter's Laboratories seal of approval—every length is made to last as long as the building in which it is installed.

CENTRAL TUBE CO.
PITTSBURGH, PA.

THERE'S TESTED STRENGTH IN EVERY LENGTH

In the News

[FROM PAGE 82]

look obsolete to the 60-ft. candle specification writer, as did the 2 to 5-ft.-candles of pre-war days. Factory lighting of 15 to 20 ft.-candles will give way to 40 ft.-candles and more in routine applications. Therefore, the time is ripe to plan for more capacity, says Mr. Murphy, to specify larger sizes of conduit and surface wiring systems than close-to-the-nose demands would call for. The layouts of today are going to be utterly inadequate five years hence in innumerable cases if penny pinching designs are employed.

A SHOP MAN'S BOOK

A practical book, "Armature Winding," on the construction, winding and repairing of a.c. and d.c. motors and generators. Connection diagrams are included for the most common types of motors, based upon the best practice of modern shops. The text is limited as to technical terms and formulas, and includes only a small amount of discussion of an elementary nature. Most of the written matter explains types of equipment, how windings are designed and installed, tips on locating trouble and in making repairs.

"Armature Winding," by Moreton, Dunlap and Drinkall, 280 pages, cloth binding, $2. American Technical Society, Chicago.

BOOK ON FUNDAMENTALS

A book for those just getting started in the trade. Prepared for beginners who like to learn about the elements of electricity by reading a book written in plain language. Covers ten major topics in an elementary way, using everyday facts for comparisons or analogies, with easily understood illustrations used throughout.

Subject matter by various authors and collaborators includes—magnetism, current electricity, elementary circuits, Ohm's Law, series and parallel circuits, light and power circuits, electric bells and signals, induced currents, transformer construction, and storage batteries.

"Elements of Electricity" by Esty, Millikan and McDougal, 248 pages, cloth binding, $2, American Technical Society, Chicago.

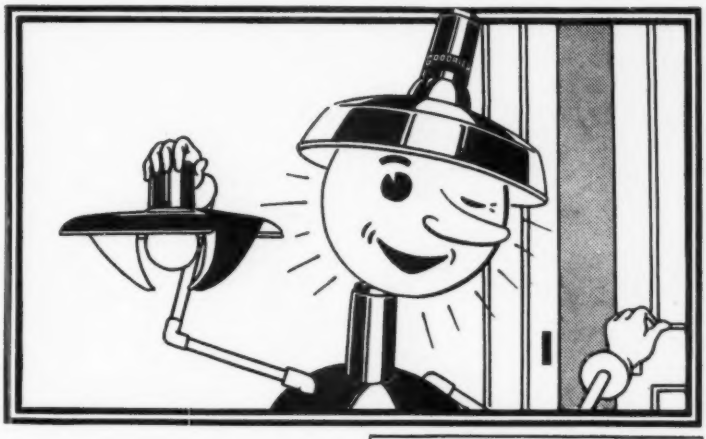
NEW FOND DU LAC, WIS. ORDINANCE

A new electrical ordinance for Fond du Lac, Wis., was adopted by the common council Nov. 4, which provides for the creation of the office of electrical inspector to enforce the ordinance. The measure provides for licensing of master electricians, sets up a board of electrical examiners, and covers the issuing of permits, inspection work, construction requirements and arbitration.

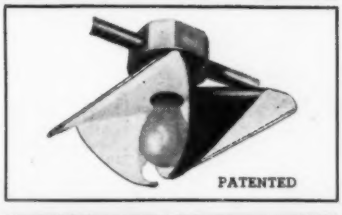
DO YOU WANT AN "IN" WITH NEW CUSTOMERS? HERE IT IS!

"Here's a real business builder . . . something new and different. It opens the doors to new customers for you — sells on first call. If your wholesaler doesn't have it, drop me a line at the address below for full information."

Sunny Lumens
The Goodrich Reflexpert



THE STOCKLITE



Designed for Lighting Shelves and Bins in Narrow Aisles

● No other lighting fixture gives you these exclusive patented features for efficient illumination in narrow aisles. Note how the peculiar design of this reflector directs light to the sides . . . how the curved, V-shaped flanges eliminate aisle glare . . . how it uses the lamp's full efficiency without wasting light on the ceiling. In hundreds of stock rooms, libraries, etc., the Goodrich Stocklite is saving time and cutting costs through more expeditious handling.

Adequate Illumination from Top to Bottom Shelves

With a high intensity of light, properly distributed, the Stocklite eliminates shadows and sharp contrasts—enables easy reading *anywhere* in the aisles to identify parts, numbers, labels, typewritten slips, etc. The Stocklite pays for itself in a short time. You'll find scores of new customers for this unique reflector. It can help you build more business.

Why not get full information? Write us today.

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES & FACTORY, 2902 NORTH OAKLEY AVENUE, CHICAGO, ILLINOIS

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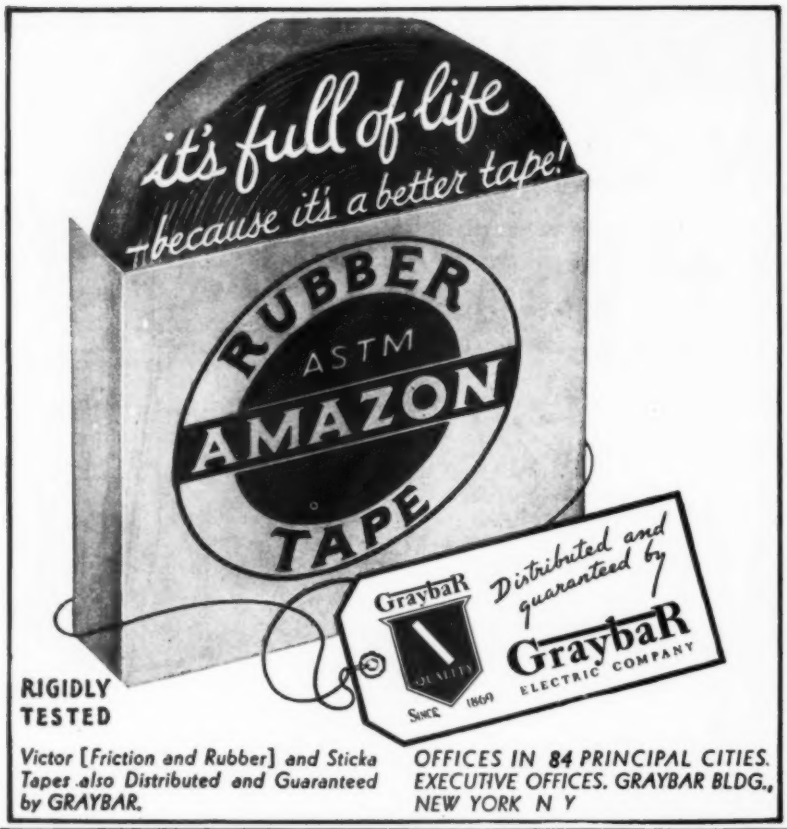


RIGIDLY TESTED

Victor [Friction and Rubber] and Sticka Tapes also Distributed and Guaranteed by GRAYBAR.

OFFICES IN 84 PRINCIPAL CITIES. EXECUTIVE OFFICES. GRAYBAR BLDG., NEW YORK N Y

FLOOR BOXES and WIRING SPECIALTIES

LATROBE

No. 330 "LATROBE" TOM THUMB UTILITY OUTLET

For use in wood installations, and other locations free from moisture or mechanical injury.

No. 110 "LATROBE" WATERTIGHT BOX

Cut-away view of No. 110 Box showing how the tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

Sell and install LATROBE—the complete line for residential, commercial and industrial work.

Catalog on request

FULLMAN MFG. CO.
LATROBE · PENN.

No. 284 DUPLEX RECEPTACLE NOZZLE

With ½" brass pipe extension. Neatest and most compact fitting obtainable. Also available with ¾" pipe extension. Fullman also offers Duplex Telephone Nozzles.

Canadian Customs

Motor dealers in the States should not form hasty opinions about their Canadian cousins, if they turn down what seem to be rare motor bargains, says W. A. Landry of the Montreal Armature Works, Ltd. Once a lage motor is ordered for shipment into Canada, the buyer is at the mercy of rather scrutinizing Customs appraisers, who sometimes collect duties which turn an original bargain into a grand and glorious white elephant.

***FIVE-STAR SPECIALIST** — Since the Buffalo 5-Star plan for home comfort and adequacy was inaugurated this summer, Harold G. Hoffman has installed four such jobs. He is a staunch advocate of getting a complete wiring job approved for every new house he figures, and stresses the inconvenience of having more outlets installed after a home is completed.*

Profits in House Wiring

Large industrial contractors often shy from ordinary house wiring jobs. But the Herman Andrae Electric Company, one of Milwaukee's largest electrical contractors, finds them profitable. A list of 22 homes recently wired by this company averages 92 outlets each. Conduit and armored cable are the systems most commonly used and the price averages $2.14 per outlet.

Inspector-Contractor

South Portland, Maine, enjoys the benefits of municipal electrical inspection. To be sure the job is done by an experienced person, G. H. Lowell of the electrical contracting firm of G. H. Lowell & Co. holds down the job for the town's selectmen.

UMI

Effective Lighting Increased from 9 to 42½ Foot Candles

Ster-Lite Fixtures in a Modern Drug Store

COLE AND YOUNG COMPANY
Jewelers Since 1874
8146 COMMERCIAL AVENUE
CHICAGO

December 9, 1937

Reflector & Illuminating Company,
1431 W. Hubbard Street,
Chicago, Illinois.

Gentlemen:

We installed new store fixtures in our place of business a year or more ago, but were unable to find suitable ceiling lights. The many lamps we investigated were of too much an indirect type, or else direct, and we did not consider them satisfactory.

Your #8000 Ster-Lites were the first we saw that seemed to fill the bill, and, upon installing them, find them more than satisfactory. They carry the effect of semi-indirect lamps for appearance, but actually have a real direct effect down on the show cases under them.

Our old lamps, a crystal basket effect, showed nine foot candles under them, and yours an average of forty-two and a half.

We are therefore very happy to recommend them for jewelry stores.

Yours very truly,

COLE & YOUNG COMPANY

WG/M Pres.

NOW you can give merchants the store lighting they've been looking for—maximum intensities at working levels—on merchandise, tables and show cases—light that dramatizes merchandise—light that actually sells.

Read Mr. Gibson's letter. He is but one of the many merchants who have been amazed and delighted with the remarkable lighting results afforded by Ster-Lite Fixtures.

Think of the many alert merchants in your city who appreciate the tremendous sales value of correct lighting. And remember that Ster-Lite Fixtures multiply lighting intensities at working levels with relatively low wattage.

Write today for literature and complete information about Ster-Lite Fixtures. Show the merchants in your community that you are first with the best.

Ster-Lite Fixtures combine the high efficiency of Sterling Silvered Glass Reflectors with the light-diffusing qualities of opal glass louvers. The reflectors project the light direct to working levels—the louvres provide diffused general illumination for eye comfort.

The combination literally turns store lighting upside down—puts maximum intensities at working levels. Write for free bulletin with installation pictures.

REFLECTOR & ILLUMINATING CO. 1435 WEST HUBBARD ST. CHICAGO

UMI

THIS SPEED REGULATOR IS COMPACT and STAYS COOL

The well planned arrangement permits circulation of air around resistance elements to dissipate the generated heat. The Ward Leonard Speed Regulator, therefore, in spite of its compact design, will operate continuously at lowest speed without overheating. It is the ideal control for fan and machine duty, especially where space is limited. SEND FOR BULLETINS.

NEW BULLETIN No. 1101
Describes the Ward Leonard Speed Regulator with ventilated enclosures. 1/20 to 1/3 H. P.

BULLETIN No. 1105
Describes the Ward Leonard Ring Type Rheostat in 1½", 2¼", 3" and 4" diameters for 30, 50, 100 and 150 watts.

WARD LEONARD
28 SOUTH STREET, MOUNT VERNON, N. Y.
ELECTRIC CONTROL DEVICES SINCE 1892

Announcing the
NEW MODEL "DM" MEGOHMMETER
No. 13583

Ranges 0—100 megohms and 0—600 volts A.C. and D. C.

Send for your copy of Bulletin No. 1723 —use this coupon.

HERMAN H. STICHT & CO.
Dept. 53, 27 Park Place, New York
Send Bulletin 1723

Name .....

Firm .....

Address .....

Trouble-Free MARR CONNECTOR

Wiring jobs are cleaner when MARR CONNECTORS are used. Installation is so simplified — only a screw driver being required—that all jobs are perfect ones. And this means "trouble-free" workmanship.

Write now for FREE sample —see how easily and quickly MARR CONNECTORS can be used.

Approved by Underwriters

THE RATTAN MANUFACTURING CO.
552 STATE STREET
NEW HAVEN, CONN., U. S. A.
GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET NEW YORK, N. Y., U. S. A.

Clean-up

A hand vacuum cleaner in the electrician's kit speeds clean-up work on extra outlets and range plug jobs and makes a better impression on the customer than borrowing the broom. The Otto Electric Company of Royal Oak, Michigan, finds that it not only builds good will but occasionally sells a cleaner.

RURAL HEADLINER — A 700-mile transmission line contract is a big rural electrification job. Out in western Pennsylvania W. R. Govett has been handling one. He is vice-president and chief engineer for W. V. Pangborne & Co., Inc. of Philadelphia. His company went out to the hills and valleys of Pennsylvania with modern ideas, having spent $30,000 for special equipment for this operation.

Community Engineer

An engineer holds forth at the Union Avenue Electric Shop in Rutherford, N. J., located near the Passaic Valley industrial plants. The name of B. W. Deutsch, Electrical Engineer, is neatly lettered on the windows for the benefit of those who are not yet acquainted with the completeness of Union Avenue electrical service.

Close Spacing

The growing practice of wiring living rooms without ceiling or bracket fixtures usually reuires several floor lamps of relatively high wattage. To insure adequacy under these conditions, amendments to the Detroit electric ordinance on January 1st will require one plug receptacle to each 10 feet of wall space in rooms without lighting fixtures.

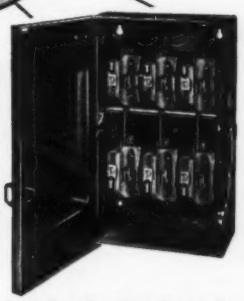
UMI

The snug row of switches shown above effectively illustrates the close-banking features of Colt-Noark Safety Switches. Space required between cabinets has been reduced to an absolute minimum through the use of the newest type Colt-Noark operating handle. Flat in design, it allows the switches to be banked within an inch of each other . . . conserving valuable space . . . bringing the installation into a compact group . . . and making for greater efficiency and convenience.

Colt-Noark Quadbreak and Dualbreak Safety Switches guarantee top notch performance . . . as well as complete safety, long life and attractive appearance.

May we send you our complete catalog . . . with detailed information?

The unit shown above is a Type A 250-Volt Dualbreak Safety Switch . . . with Quick Make, Quick Break, interlocking cover . . . and flat type operating handle. Type C Switches in 575 Volts also feature flat type handle.



Typical of the Type A 575-Volt Quadbreak line is the switch shown above . . . with four breaks in each leg to reduce arcing to a minimum . . . Quick Make, Quick Break, interlocking cover . . . and flat type operating handle.

COLT'S PATENT FIRE ARMS MFG. CO., Electrical Division, HARTFORD, CONN.

100 Years of Manufacturing Experience is back of every Colt Built Product

COLT-NOARK

SWITCHES INDUSTRIAL CONTROL EQUIPMENT FUSES

Boston
New York
Chicago
Philadelphia

UMI

About NECA

NECA EXECUTIVE FIELD TOURS

Plans are being made by President Peak and General Manager Davis to cover every section of the country this year as thoroughly as possible. President Peak plans to give ten days to two weeks of his time in each of as many divisions as possible, in cooperation with the Divisional Executive Committeemen.

President Peak's first trip will be through the Southeastern states, during the last two weeks of February in cooperation with Executive Committeeman D. B. Clayton and Vice-President Walker. Their itinerary includes attendance at the mid-winter convention of the Florida State Association at Orlando on February 21st and 22nd. General Manager Davis is arranging a trip through New England in February, starting with a meeting scheduled at Pawtucket, R. I., on February 16th.

On January 20th, President Peak was the guest speaker at the annual meeting of the Youngstown, Ohio, Chapter, N.E.C.A. On January 24th he was the guest of the Electrical Association of Philadelphia. In the afternoon he addressed a meeting of electrical contractors of Philadelphia and the surrounding territory.

MID-WINTER MEETING OF EXECUTIVE COMMITTEE

The mid-winter meeting of the NECA Executive Committee was held at National Headquarters in New York City on January 26th to 28th. The agenda for the meeting covered many important matters relating to the Association's program for 1938. A report of the proceedings could not be prepared in time for this issue.

DIRECTORY OF LOCAL CONTRACTOR ASSOCIATIONS

A revised directory of local electrical contractor associations is being compiled by NECA. It is desired to make this directory as complete as possible, so that every local association throughout the country may have full information regarding all other associations. Names, titles and addresses of their active executive officers will be stated, including presidents, secretaries or paid executives, if a staff secretary or executive manager is employed.

The cooperation of every reader of *Electrical Contracting* is requested to make this survey complete. If you have not already done so, will you please write to National Electrical Contractors Association, 420 Lexington Ave., New York City, giving the name of your local association in full, with the name, proper title and address of the executive officer in your association.

STATISTICAL ANALYSIS FOR CONTRACTORS

A report form has been sent out by NECA to several thousand electrical contractors to be used in the preparation of a statistical analysis of expense and operating ratios for the year 1937. This year's survey is designed to give more than the ratios of the various items of the cost of doing business to sales billed and to prime cost of sales. It will also show the percentage of contractors business represented in new residence construction, commercial buildings, industrial installations, public structures financed by government money, repairs, renovations and modernization and rural electrification.

HEADS PIONEER FIRM—Coming up from the ranks, S. D. Thacher has acquired ownership of the E. L. Overton Electric Co., the oldest electrical business in Topeka, Kans. Thacher served as construction superintendent for the past fifteen years under the late E. L. Overton, who founded the business over 50 years ago. As the new boss, Mr. Thacher announces the addition of a modern engineering and management service in addition to large contracting projects, supplies and air conditioning work. Thacher is also vice-president of the Topeka Chapter of NECA.

This will be the most extensive survey of business costs in the electrical contracting field since 1930. Figures gathered during the business depression years have shown such abnormal ratios as to be of little value in comparison with normal operating costs. It is felt that 1937 carries a sufficient return to normal volume to give a valuable index to present operating costs.

Any electrical contractor not a member of NECA can secure copies of the report forms from NECA Headquarters for use in this survey. If he submits the information requested on these forms he will receive a copy of the composite results as soon as they are tabulated. All figures submitted are held strictly confidential and will be used only for the purpose of obtaining composite figures on operating costs and present trends in the contracting business.

NECA CONVENTION TOUR FILM

New York members of the NECA Convention Tour party and their ladies, attended a showing on Jan. 25 of a full length feature picture of the NECA Convention Tour taken by Robt. W. McChesney of Washington. About one quarter of the picture was in colors and the entire film presented a most interesting story of the 20-day tour to Grand Canyon, Boulder Dam, Los Angeles, Yosemite, San Francisco, Portland and Seattle.

A large number of other electrical contractors and members of the industry were also present.

USE OF WIRING HAND BOOK

Some 34,000 copies of the Handbook of Interior Wiring Design are already distributed through the country. To obtain better knowledge of the extent to which they have been put to use, NECA sent out a questionnaire to key men in the principal cities throughout the country. The returns from this questionnaire formed the basis of a report submitted to the joint Industry Committee on Interior Wiring Design, presented by Allan Coggeshall, NECA representative on the Committee, at their meeting held on January 25th.

The replies indicate that copies of the Handbook have reached all contractor members of NECA. But in most of the cities reporting only a few copies have reached the hands of other electrical contractors. In a few cities the local electrical leagues or the utility companies have distributed a limited number of copies. But only in those cities where special meetings have been arranged for a study of the handbook has there been a systematic distribution and encouragement of the use of the handbook among electrical contractors generally.

Only 20 per cent of the cities replying have held such meetings for promotion of the handbook, but in several of those cities the results indicate that it was well worth while and created wide interest in the use of the handbook. Several cities replied

Curtis Lighting Photo

that makes this type of installation

COMPLETELY AUTOMATIC

This suggestion may mean more business: Check back on the display lighting jobs you installed last year and if you find any which didn't get a time-switch--well, there is a real prospect for you.

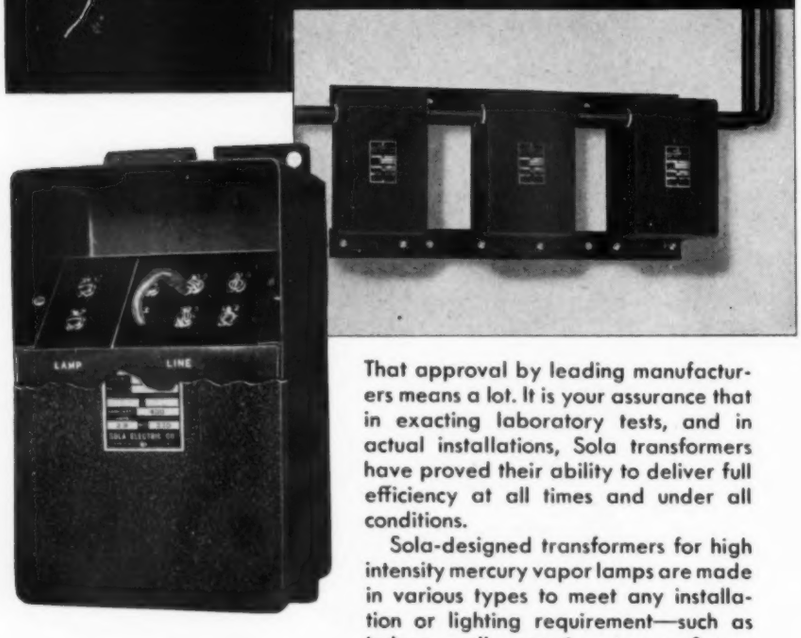
This simple truth will help you sell: Modern display lighting is a great deal more economical and just as effective when it is used at the proper time --a definite assurance when a Sangamo Time-Switch controls the lighting.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

UMI

APPROVED by MANUFACTURERS of MERCURY VAPOR LAMPS



This is the indoor wall mounting type. Note the large, roomy outlet box and the convenient, plainly marked terminal board.

That approval by leading manufacturers means a lot. It is your assurance that in exacting laboratory tests, and in actual installations, Sola transformers have proved their ability to deliver full efficiency at all times and under all conditions.

Sola-designed transformers for high intensity mercury vapor lamps are made in various types to meet any installation or lighting requirement—such as indoor wall mounting types, fixture types, outdoor, wall mounting, weatherproof types, or weatherproof pole mounting types.

SUSPENSION TYPE
an integral part of the lighting fixture

Here's a beauty—and just as practical and efficient as it is attractive—the Sola suspension type, which becomes an actual part of the lighting fixture.

This famous cylindrical transformer, with its roomy outlet box and attractive black crackle finish case, has quickly become a favorite throughout the country because of the ease with which it can be installed.

Write for price list and descriptive literature of the complete Sola line.

Your electrical jobber can serve your requirements.

LISTED BY UNDERWRITERS

SOLA ELECTRIC COMPANY, 2525 Clybourn Ave., Chicago, Illinois

SOLA
MERCURY VAPOR LAMP TRANSFORMERS

About NECA

[FROM PAGE 90]

that no previous thought had been given to the holding of such meetings but as the result of the questionnaire sent out the matter had been taken up with the utility managers. It was agreed that such meetings should be held as soon as possible and a systematic study and use of the handbook encouraged.

Reports on the distribution of the handbook among architects and engineers indicated that in most cities there has been a considerable distribution of the handbook among architects and engineers. But only in a few instances has the distribution been complete or handled in a systematic way. Several cities, however, reported 100 per cent distribution to architects. Others, distributed only to the leading architects. One city reported a distribution of 200 copies to architects and their draftsmen and stated that "it appears that an additional 100 will be needed for such distribution."

In addition to distribution of the handbook through utility companies and electrical leagues, several cities reported that the principal wholesalers have placed a considerable number of copies of the handbook, through their salesmen. In a number of the cities, distribution of the handbook have been made to all company executives in the employ of utilities and wholesalers and to a considerable number of electrical contractors who were not members of NECA or receiving the handbook through local association membership.

In those cities where there has been systematic and carefully planned distribution of the handbook among architects and their draftsmen there is definite evidence of influence on wiring design.

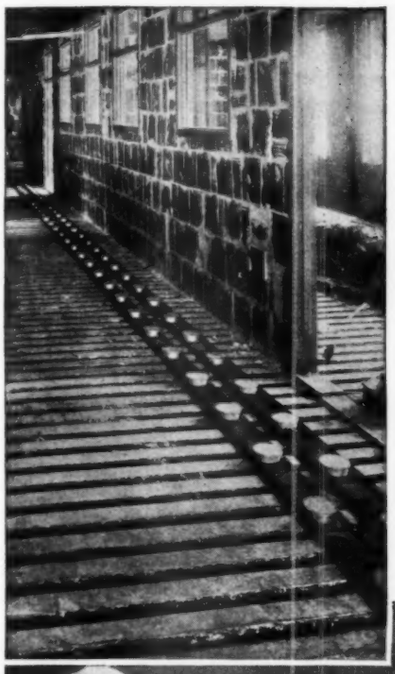
LABOR RELATIONS COMMITTEE

Announcement will be made on February 2, of the results from the final election ballots for the Labor Relations Committee. This will give one representative from each of the twelve national divisions to be members of the special Labor Relations Committee authorized by the national convention at Los Angeles.

The committee will be called together as soon as possible after the close of the election. The duties of the committee will be to formulate a plan with reference to labor relations, to be submitted to the Executive Committee, which will refer it on approval to the chapters and membership for ratification.

Material for this department is supplied by the headquarters staff of the National Electrical Contractors Association, 420 Lexington Avenue, New York.

How to *Safeguard the Electrical Future* of any Building



THE Robertson Steel Floor is designed to meet changing electrical needs of the future. It offers features that insure longer life for buildings in which it is used. Its cellular construction makes possible electrical availability of a revolutionary kind. The use of the Robertson Steel Floor means easier wiring, more flexible and comprehensive layouts. Wires may be run through the hollow, parallel cells and outlets cut in wherever desired . . . over the entire floor area.

Structurally, the Robertson Steel Floor is light in weight yet exceptionally strong, rigid, easy to install, fire and corrosion resistant.

Investigation will prove to you that here is the ideal floor for modern factories, homes, office and public buildings. Write today for our free books which contain detailed information, "Wiring Robertson Cellular Steel Floor" and "New Life For Buildings." Address H. H. Robertson Co., 2003 Grant Building, Pittsburgh, Pa.

THE ELECTRICAL POSSIBILITIES *of the Robertson Steel Floor Wiring Method are unlimited. Above is shown one of the types of Robertson Floor with its characteristic headers which form continuous fishable wireways at right angles to the direction of the cells. The number of headers and spacing of access units is determined by the number of systems used.*

BELOW IS SHOWN A *finished floor with Robertson outlets in place. Note adapters carrying discs of the floor covering.*

ROBERTSON STEEL FLOOR SYSTEM

WITH THE *Manufacturers*

P. J. Hopkins Dies

P. J. Hopkins, vice president of the Great Western Fuse Company of Pittsburgh, died on January 10. He had been associated with this company for the past thirty years.

•

General Electric News

Nathan R. Birge, assistant to the president of the General Electric Company since 1927, has been elected a vice president of the company. Mr. Birge will be located in Schenectady.

R. J. Cordiner has been appointed manager of the appliance and merchandise department. He succeeds Charles E. Wilson, who was recently elected executive vice president.

Stuart M. Crocker, vice president of the International General Electric Company, has been appointed to the additional responsibilities of assistant to Charles E. Wilson, executive vice president of the General Electric Company.

A new miscellaneous construction materials sales section has been formed, by the Appliance and Merchandise Department in Bridgeport, to provide for initial sales development of commodities not classified under existing sections. H. Austin Cook has been made manager of this section.

George Campbell, manager of the Schenectady local sales office, assumed the added responsibilities of management of the Syracuse office on January 1. Mr. Campbell succeeded A. J. Hornsby in the Syracuse area, who retired on December 31.

A. E. Pierce has become manager of the oil furnace sales division of the air conditioning department. Mr. Pierce will make his headquarters at Bloomfield, N. J.

Sumer C. Rider, who has been a member of the New York district publicity section for the last six years, has joined the staff of the G. E. Home Bureau in New York. He will be associated with advertising and promotional activities.

Bernard F. Hennessy has been named field representative for the Home Bureau, with headquarters in Atlanta.

The General Electric Company has opened its new $700,000 building in Los Angeles, at 212 North Vignes Street. In addition to housing the district sales offices of the company, the new building will be the headquarters of the Los Angeles office of the G-E Appliance and merchandise department, and the General Electric Contracts Corporation, as well as the Los Angeles office and warehouse of the General Electric Supply Corp., the company's wholesale distributing subsidiary.

•

The Allen-Bradley Company has moved into larger quarters in Cincinnati, at 2331 Reading Road. W. L. Jaeckel is district manager.

•

Bulldog Electric Products Company of Detroit, Mich. has appointed Ernest K. Higginbottom as its Atlanta district representative, to cover South Carolina and portions of Georgia, Florida and Alabama. He will maintain offices at 2214 Peachtree Street, Atlanta.

•

NECROMANCER — *Dr. Samuel G. Hibben, director of applied lighting, Westinghouse Lamp Co., recently brought the dark magic of black light to Chicago for the amazement of the Rural Electric Session of the American Society of Agricultural Engineers. After time out to greet old friends at an Old Timer's luncheon on the following day, he also presented his brilliant display of future lighting sources to a meeting at the Chicago Lighting Institute.*

Graybar Changes

C. G. Matthews, manager at Milwaukee, has been appointed sales manager at Boston, replacing F. X. Fitzpatrick, who has asked to be relieved as sales manager, on account of ill health. Mr. Fitzpatrick will be in charge of public utility business at Boston.

R. J. Harkins will become manager at Milwaukee, succeeding Mr. Matthews.

The Jacksonville branch of Graybar became a main house on January 1, with Savannah, Miami, Orlando and Tampa as branch offices. Douglas Wallace has been named district manager, with headquarters at Jacksonville.

R. C. Litchfield and G. A. Antrim have been appointed assistant general merchandising managers reporting to D. H. O'Brien in the General Department.

•

On January 1, the **Revolite Corporation** changed its name to **Industrial Tape Corporation,** New Brunswick, N. J. They will manufacture the same products as heretofore.

•

Paragon Sales Company of Philadelphia has been appointed sole selling agents for the Electra Mirror Switch Plate manufactured by the Hartley Gauge Corporation of Landsdale, Pa. Paragon's office is located at 402 Cherry Street, Philadelphia.

•

S. & M. Lamp Appointments

Arthur Johnson has been appointed sales manager of the Floodlight division of the S. & M. Lamp Co., Inc., of Los Angeles, California. Ray Fox has been made sales manager of the automotive and marine division of this company.

S. F. Marker has been made sales representative for its floodlight division, covering the states of Missouri and eastern half of Kansas. Mr. Marker's headquarters are located at 5409 Woodland Ave., Kansas City, Mo.

•

Cutler-Hammer, Inc. of Milwaukee, Wis. announces that a company known as Canadian Cutler-Hammer Limited has been organized for the purpose of manufacturing its motor and generator control products for the Canadian market. The company will be a subsidiary of the Amalgamated Electric Corporation. The new company will be located at 384 Pape Avenue, Toronto 6, Canada.

•

Arrow-Hart & Hegeman Electric Co. announces the appointment of Harold J. Fonda as manager of its district office located at 3200 Main St., Dallas, Texas. Mr. Fonda has for several years, been connected with the sales department of this company in different territories.

WARNING
HEAT WAVES AHEAD!

•

ENJOY BIGGER AND BETTER FAN PROFITS THIS YEAR WITH GENERAL ELECTRIC QUIET FANS, THE FASTEST-SELLING LINE OF QUALITY FANS!

•

YOU'LL HAVE NEW FANS—QUIETER AND MORE EFFICIENT THAN EVER—AND NEW SALES PROMOTION AND ADVERTISING HELPS—MORE NUMEROUS AND BETTER THAN EVER!

•

ASK YOUR DISTRIBUTOR'S SALESMAN FOR COMPLETE DETAILS. YOU'LL PROFIT BY IT!

GENERAL ELECTRIC FANS

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

•

EQUIPMENT NEWS

Combination Starting Switch

In this new combination starter, Bulletin 713, the standard disconnect switch has been replaced by circuit breakers. The automatic starting switch is the solenoid type, with double break, silver alloy contacts and two thermal overload relays. Circuit breaker is enclosed in a case and has three poles operated by a single lever. These units have a maximum rating of 30 h.p., 220-volts; 50 h.p., 440-550-volts. Allen-Bradley Company, 1311 South First Street, Milwaukee, Wis.

ALLEN-BRADLEY STARTING SWITCH

■

TRUMBULL MULTI-BREAKER

Multi-Breaker

Type "M" non-industrial circuit breaker is to provide separate circuit metering in a compact device or for service entrance range or hot water heater circuits. Available for 2 and 3 wire, solid neutral service with either grounded or insulated neutrals, breaker capacities include 15, 20, 25, 35 and 50 amperes, for flush or surface mounting. Boxes with flush covers have provision for adjustment of unit block to plaster line. Size 9-in. by 4¾-in. Trumbull Electric Mfg. Co., Plainville, Conn.

WESTINGHOUSE BOOSTER-REGULATOR

Booster-Regulator

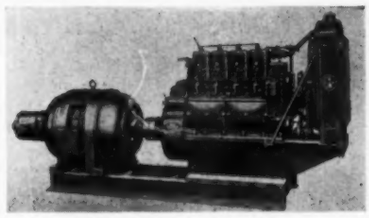
This LR four step booster-regulator is particularly applicable to conditions where load changes over a wide range cause considerable fluctuation in voltage as well as low voltage during heavy-load periods. Outdoor type arranged for either pole or platform mounting. Control with reset timing relays is adjustable from 10 seconds to 50 minutes. Available in ratings 2400-volts from 5 to 24 Kv-a.; 4800-volts from 5 to 37.5 Kv-a.; 6900-volts from 5 to 50 Kv-a.; 11500-volts from 10 to 75 Kv-a., all single phase, 60 cycle. Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

■

Spot Lighting

S & M unit No. 452 known as "Hot Spot" gives high intensity with low wattage. For use in window displays to high light one or two attractions. A standard 100 watt silvered bowl lamp is used. Complete with universal bracket, 4 feet of rubber covered cord and plug. S & M Lamp Co., Inc., 119 West 36th Place, Los Angeles, California.

S & M "HOT SPOT"

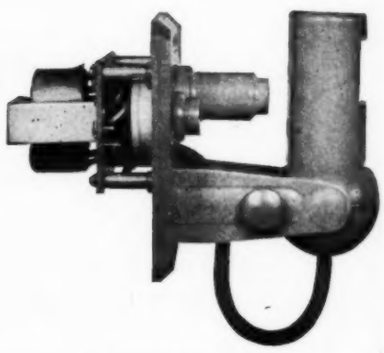


FAIRBANKS, MORSE GENERATING SET

Diesel Generating Set

Model 36-A Diesel generating sets are used in industrial plants, as independent units carrying entire load or for parallel or auxiliary operation in conjunction with other electrical service. Adapted for use on machines requiring individual power plants, such as electrically operated shovels and dredges and portable and semi-portable electric power plants on construction work. Alternating current sets available in ratings from 5.3 to 100 kva. and direct current sets from 5 to 80 kw. Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

■



G-E PHOTOELECTRIC CONTROL

Photoelectric Control

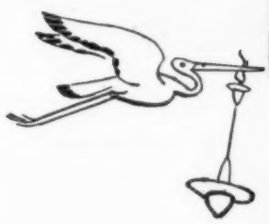
This photoelectric lighting control keeps light in a room or building at proper level. When artificial light is needed to keep illumination at a predetermined level, lights are turned on automatically. When enough natural light is available, the artificial light is turned off. A phototube is set up so that natural light coming through windows falls on tube. With this type of control installation, you turn the wall switch as usual. Flush-mounted and surface-mounted models available. Connections to lighting circuit of building are made at regular wall switch. General Electric Company, Schenectady, N. Y.

■

Acid Resisting Paint

Sarva acid resisting paint is for interior use. Protects surface from corrosion by acids, chemicals, alkalies and fumes. Used in bleacheries, blow cases in sulphuric plants, underground and inside pipe lines, mines, battery boxes, acid baths and salt plants. Also for

A New Luminaire BORN TO SELL!



BEAUTIFUL
EFFICIENT

B-50

A FEW USERS OF PERMAFLECTOR LIGHTING

Apartment Buildings	Food Markets
Art Galleries	Furniture Stores
Automobile Dealers	Furriers
Banks	Gymnasiums
Beauty Shops	Hotels
Churches	Jewelers
Clothing Stores	Museums
Dairy Stores	Newspapers
Department Stores	Office Buildings
Five and Ten Cent Stores	Public Buildings
	Schools
	Stock Exchanges
	Theaters

These people are YOUR prospects.

YOU will discover new opportunities for increased profits in this new Permaflector Luminaire that has everything—EYE APPEAL, PERFORMANCE APPEAL, and PRICE APPEAL.

The sleek flowing lines assume a simple pleasing shape that reflects the spirit of this streamline age. Its lasting beauty and adaptability to any interior will please your prospects instantly, and make sales easier.

This luminaire is equipped with a Permaflector which provides permanent, efficient distribution of light that will build satisfied customers and repeat orders.

Simple design and economy in manufacturing methods enable you to offer this unit at an extremely low price that is in line with present day budgets.

Write or send the coupon below for complete details of construction and installation.

PITTSBURGH REFLECTOR CO.

Pittsburgh, Pennsylvania

Representatives in 28 Cities

PERMAFLECTOR *Lighting*

PERMAFLECTORS · LUSTROLIERS · LUMINAIRES · SPOTLIGHTS · URNS
FLOODLIGHTS · LAMPS · BUILT-IN CEILING UNITS · ACCESSORIES

PITTSBURGH REFLECTOR COMPANY
OLIVER BLDG., PITTSBURGH, PA.

Please send me without obligation your folder entitled a "NEW PERMAFLECTOR LUMINAIRE" which gives complete data for sales and installation.

NAME.....

STREET.....

CITY.....STATE.....

For

Residence Wiring

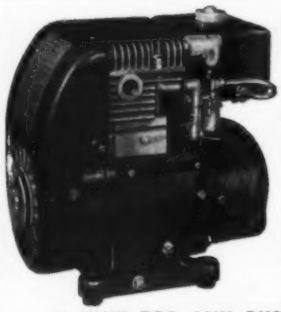
The Best and Safest Method is a properly installed KNOB and TUBE job. Be sure and get the

TRADE MARK Bull Dog REGISTERED

Assembled Knob because it "HAS A GRIP LIKE ITS NAMESAKE."

ILLINOIS ELECTRIC PORCELAIN CO
MACOMB, ILLINOIS

Complete Electric Plants



NEW 1938 Models

A UNIT FOR ANY PURPOSE

In the COMPLETE LINE OF ONAN ELECTRIC PLANTS are AC and DC types, 6, 12, 32 and 110 volt, also AC-DC Combination Units. Sizes 350 to 5000 watts to meet the requirements OF THOSE WHO MUST PROVIDE THEIR OWN ELECTRICITY for FARMS, SUMMER CAMPS, COTTAGES, BOATS, COMMERCIAL PURPOSES and STANDBY SERVICE. Run on Gasoline, Gas or Kerosene.

OPERATE HOUSEHOLD APPLIANCES

RADIO, WATER PUMP, MOTORS—anything that normally would operate from city lines. Will RUN PUBLIC ADDRESS and SOUND CAR EQUIPMENT. The sale of an Electric Plant calls for WIRING, FIXTURES, APPLIANCES which mean additional profit.

WRITE FOR DETAILS ON

Liberal Dealer's Proposition and territory assignment.

D. W. ONAN & SONS
1296 ROYALSTON AVE., MINNEAPOLIS, MINN.

EQUIPMENT News

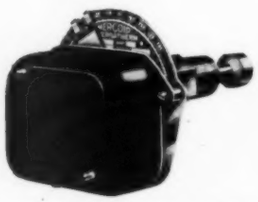
[FROM PAGE 96]

coating interior of wood and metal tanks. Will not discolor water. Made from genuine 99.5 per cent pure Gilsonite natural asphalt, special acid resisting resins and oils. Available in red and black. American Asphalt Paint Co., 43 E. Ohio Street, Chicago, Ill.

■

Hot Water Control

This year-round hot water supply control is used with steam, vapor and hot water systems employing indirect hot water heaters. Small size of control permits it to be installed in locations crowded for space. The two wire system is used. Sealed mercury switch used remains in stationary position. Operates by means of a small permanent magnet that is actuated by a bimetal coil inclosed in copper shell housing, through which the water temperature is rapidly transferred. (This cut was inadvertently used last month in illustrating the Mercoid Type DA-121 control.) The Mercoid Corporation, 4201 Belmont Ave., Chicago, Ill.



MERCOID HOT WATER CONTROL

■

Extension Flashlight

In the "Everyready" industrial line, this flexible extension flashlight enables engineers and mechanics to project light into equipment which has narrow openings or restricted spaces. Also recommended for theatre ushers as a means of locating lost articles. National Carbon Company, 31 East 42d Street, New York

NATIONAL CARBON FLASHLIGHT

■

Electrode

A steel arc welding electrode designed for use with small a.c. transformer welders. Known as "Transweld", it has a heavy extruded coating, a stable arc, easy to strike and hold. Slag is easily removed from its deposits.

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

YOU CAN'T GO WRONG—
if you **"RELY ON RELIANCE"**

A complete line of thoroughly dependable quality time switches with innumerable exclusive features, giving you more time switch sales opportunities.

For 28 years the name of Reliance has stood for the best in the time switch field. A good line to handle because profits are not eaten up by expensive come-backs.

See your wholesaler or write for complete descriptive literature

RELIANCE AUTOMATIC LIGHTING CO.
1937 MEAD STREET RACINE, WIS.

Suitable for making all types of welds in flat, horizontal, vertical or overhead position. Also operates with direct current of either straight or reversed polarity. Available in three sizes; 3/32, 1/8 and 5/32-inch. Smaller size comes in 12-inch lengths, other two in 14-inch. The Lincoln Electric Company, Cleveland, Ohio.

■

Air Circulator Table

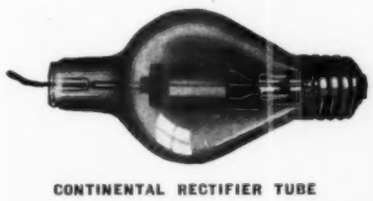
The cool-circle-ator table is a new device for recirculating cool air. The design and arrangment of blades, draws in cool air and gently recirculates it around the room. Finished in brown and ivory with removable top, which can be used as a handy serving tray. All mechanical parts enclosed in a grill which serves as a safe-guard against injury to children, pets, etc. For use in homes, offices, restaurants, stores, hotels, hospitals. Kisco Co., Inc. 44-14 W. Papin St., St. Louis, Mo.

KISCO COOL-CIRCLE-ATOR TABLE

■

Rectifier Tube

Mercury vapor rectifier tube, type 2-RA-15, is designed for low voltage applications such as projector arcs, arc welders. Guarantees 2000 hour life for tube when used within limits specified. Electrical characteristics—filament voltage, 2.5-volts; filament current, 16-amp.; d.c. output, 15-amp.; d.c. output (crest), 45-amp.; arc drop, 5-8-volts; pickup voltage, 8-11-volts; d.c. output voltage, 60 volts max.; crest inverse voltage, 200 volts max.; filament heating time, 2 to 3 min.; overall length, 8½-in.; overall diameter 3¾-in. Continental Electric Co., Geneva, Ill.



CONTINENTAL RECTIFIER TUBE

"ROME-CABLE"
BUILDING WIRE

Durability is a "must"

"Durability" — that comes from best materials properly combined — is a *"must"* specification in the manufacture of every foot of "Rome Cable" wire and cable.

That's why you can depend upon these products to build customer good will and more wire sales.

ROME-CABLE ROME, N.Y.

ROME CABLE QUALITY

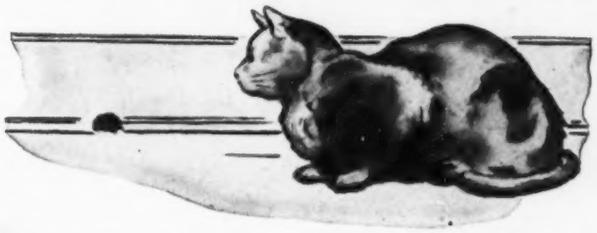
- Code, Intermediate 30% and Super-aging
- Slick finish for Quick and Easy Pulling
- Approved by the Underwriters' Laboratories, Inc. N.E.C.S.
- Long Aging Rubber Uniformly Small Diameters
- Clean—Easy Stripping
- Flame and Moisture Resistant
- Eight Clear Distinct Colors

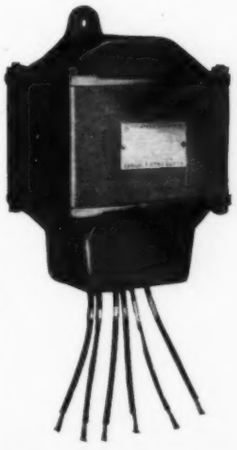
PRODUCTS — *Hot rolled rods, bare and tinned copper wire, bare and tinned strand, U.R.C. weatherproof wire, cotton, paper and asbestos magnet wire, rubber insulated wires and cords, lead covered cables.*

ROME CABLE CORPORATION

SALES OFFICES—New York, Chicago, Philadelphia, Pittsburgh, Richmond, Cleveland, Boston, Dallas, Los Angeles.

Right On the Job!





YOU can profit by placing air-cooled transformers "right on the job" at load centers in your plant to reduce power voltages for 115-volt power loads, and—where permissible—for lighting. The use of these transformers makes possible distribution of power throughout a plant at the power voltage only, thereby eliminating the additional expense of a long, separate 115-volt circuit.

For a complete description, write to General Electric Company, Schenectady, New York.

GENERAL ELECTRIC

Change Easily to 110 Volts

or any other voltage

from 220, 440 or 550 Volts

with

SORGEL *AIR-COOLED* **Transformers**

Practical, economical, efficient—for **lighting, portable tools, heating devices.** SORGEL *Air-Cooled* Transformers can be installed in any convenient place inside of buildings. No fire-proof vaults or enclosures needed; no oil; no upkeep.

Stock sizes ¼ to 50 KV-a Larger sizes built to order.

Write for literature with diagrams and prices.

SORGEL ELECTRIC CO.
No. Plankinton Avenue Milwaukee, Wis.

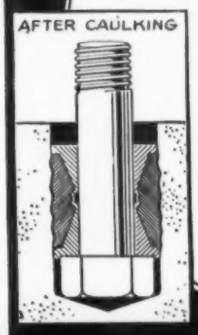
For Maximum Holding Power-

and a *permanent* bolt anchorage—strong as the material in which it is installed — use **RAWL-ANCHORS.**

Foolproof one-piece construction—no mis-assembling and losing of "parts." No creeping of lead or turning of bolt in hole.

Many other features.

Write for data.



THE RAWLPLUG COMPANY, INC.
93-94 Lafayette St.
New York City

RAWL-ANCHORS

ONE-PIECE BOLT ANCHOR

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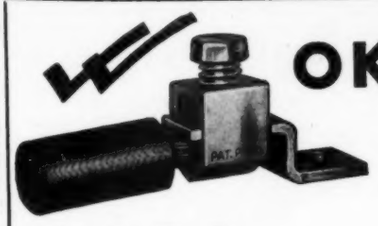
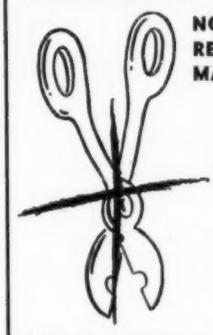
* See 1937-1938 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.



ILSCO

SOLDERLESS CONNECTOR



NO SPECIAL TOOLS REQUIRED TO MAKE CONNECTION

ILSCO solderless connectors eliminate need for special tools, thereby providing faster, **permanent** connections. Other ILSCO features:

NO set-screw contact . . .
NO flattening or separating of stranded wires
NO limitation to one size wire . . .
NO shearing effect whatsoever . . .

NO need for you to search any longer for the PERFECT Solderless Connector . . . **WE HAVE IT!** Six Sizes Take Care of All Wires from No. 14 to 1,000,000 C.M.

FREE—A large display board bearing mounted samples of ILSCO lugs. Address Dept. EC

ILSCO COPPER TUBE & PRODUCTS, INC.
5629 Madison Road, Cincinnati, Ohio

It **PAYS TO BUY** *from* **CO-OP**

Send For **Co-op Monthly CATALOG**

Co-op Monthly

CONTRACTOR'S WHOLESALE BUYING GUIDE
PRICE QUALITY SERVICE

Dealers Wholesale Catalog

CO-OP ELECTRIC SUPPLY CO.
812 W. Jackson Blvd., Chicago, Ill.

NEW! Federal EXPLOSION and VAPOR PROOF Horn

An Industrial Siren for Hazardous Locations

For many years there has been a need for signals in locations of hazardous nature. Federal engineers have now designed horns that are loud and penetrating, and still, are so manufactured, that they meet the specifications of the Underwriters' Laboratories, with respect to hazardous locations.

The horns are extremely rugged. Finest quality of materials. No corrodible metals used. Easy installation, a splicing conduiet is attached to the housing with a close nipple. Condulet is tapped for ¾" conduit. Finish is aluminum.

The noise emitted will carry over ordinary factory noises. Can be supplied for either A.C. or D.C. for voltages ranging from 6 to 250 volts. Specify definite voltage required.

No. 30 EX A.C.
No. 40 EX D.C.

Ask for catalog p. 106.

FEDERAL ELECTRIC CO., 8726 S. State St., Chicago, Ill.

...AND NOW FOR

Industrial Adequacy

Here's a business getting campaign in industrial wiring that is proven!

Mr. Electrical Contractor! On the next three pages you'll find a way to develop new business in connection with Anaconda's "Modernize Wiring" campaign. ➔

Anaconda Wire & Cable Company

General Offices: 25 Broadway, New York • *Chicago Office:* 20 N. Wacker Drive • *Sales Offices in Principal Cities*

We do this so that...

Ads like these make the industrial executive think about re-wiring

AS AN AID to contractors in their service to industrial customers, Anaconda Wire & Cable Company is carrying on the promotional program shown here. In *Time, Business Week,* and a long list of publications going to the industrial executive, ads like those shown here point out the waste caused by antiquated, deficient electric wiring and urge the industrial plant to do something about it.

This publicity is really "clicking". Plant executives are interested. They are realizing now the need of making better use of the power they buy. This program is a business-getting campaign, designed for your benefit. Make use of it! On the next page, we show you just how to profit from it.

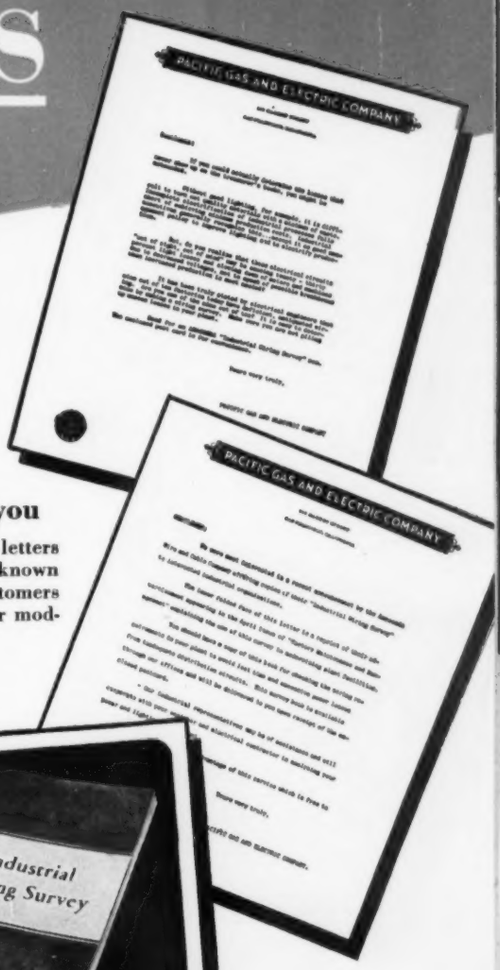
Anaconda Wire &

General Offices: 25 Broadway, New York • *Chicago Office:* 20 North Wacker Drive

...you can do this

Ads for you

These messages, suitable for use in newspapers, direct-mail advertising or your own company publication, are being used by utilities and electrical contractors.



Letters for you

Here are samples of letters used by one well-known utility to tell customers about the need for modernizing circuits.

Tie in with a local campaign of your own! Contractors find it profitable

MANY CONTRACTORS have found it profitable to cooperate with the "Modernize Wiring" campaign outlined on the preceding page. Many others are in process of organizing local campaigns with utilities.

One Vermont electrical repair shop, for instance, obtained so many leads from a localized "drive" based on the Anaconda program that they opened up a wiring department. This has now operated for more than a year with great success.

Why not organize a campaign for your community? This method of selling is now so thoroughly tested that every step can be outlined in advance with assurance that profitable results will follow when the program is carried out. The "Modernize Wiring" program is sound economics. When an industrial plant manager is convinced that modernized wiring will save money, he will spend money for wiring and electrical work. Books, sales letters, materials for ads, and complete directions for carrying out a campaign are now available. Turn the page and see.

Sales aids

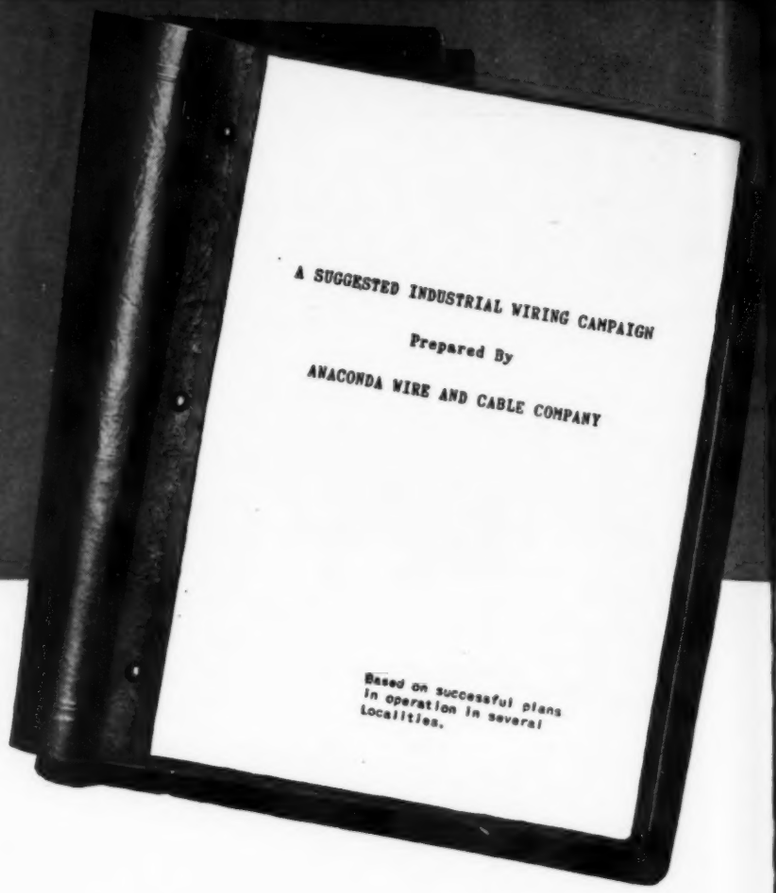
The Industrial Wiring Survey and the Industrial Wiring Guide described on the next page are available to you for distribution to your customers.

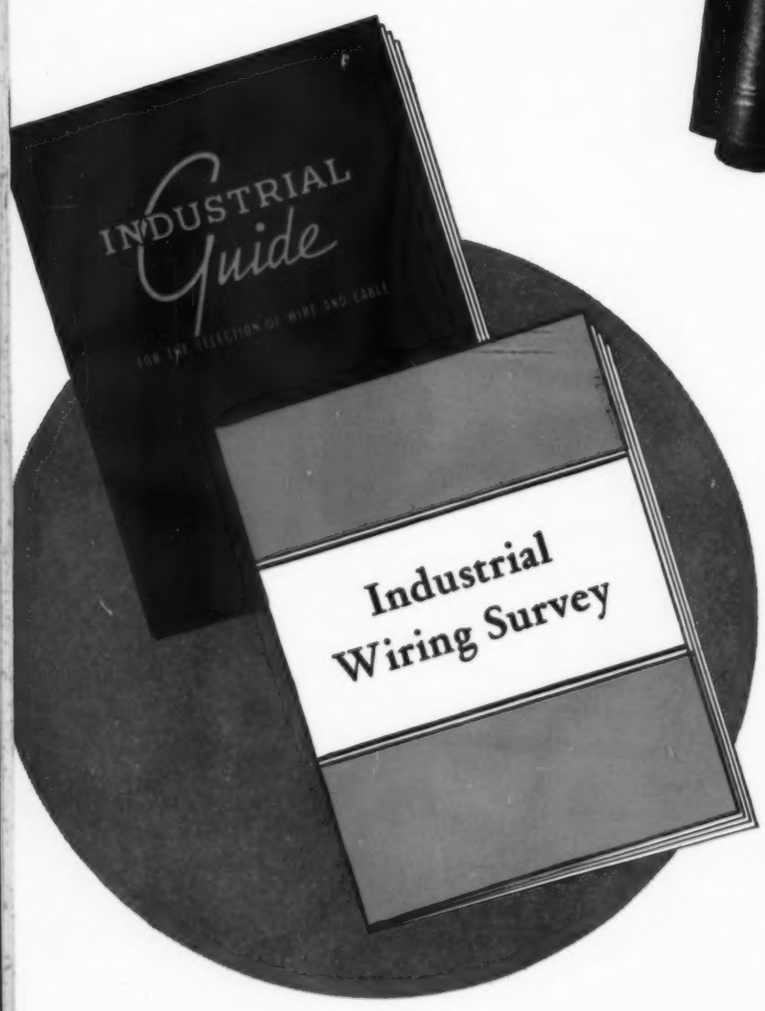
Cable Company

ANACONDA
from mine to consumer

Sales Offices in Principal Cities

Let us send a plan for you!


A SUGGESTED INDUSTRIAL WIRING CAMPAIGN
Prepared By
ANACONDA WIRE AND CABLE COMPANY
Based on successful plans in operation in several Localities.



ABOVE is a program outlined by us for use of one contractor. It gives every step in the planning of a "Modernize Wiring" promotional drive among industrial plants and other power users.

The books shown at the left are the "spearheads" of the program we recommend. The lower one furnishes information on how to make a wiring survey to detect defects in circuits. The "Industrial Guide" tells what to do to correct the conditions which the survey reveals. They are invaluable for you.

Based upon use of these two books, we outline a program suited to your individual needs. It will be presented in the form shown above. With this Plan, you can interest your local utility in collaborating with you on a campaign, or you can put on a localized "drive" yourself. Here is all the basic information you need for carrying out a campaign.

An Anaconda representative will be glad to discuss with you the entire subject of a "drive" such as we suggest. Just let us know your wishes. The coupon is for your convenience. Do not delay. Mail it today!

ANACONDA
from mine to consumer

2H4500

TEAR OUT, FILL IN AND MAIL TODAY

Anaconda Wire & Cable Company
25 Broadway, New York, N. Y.

Please send me complete outline of your Promotion Plan *for electrical contractors.*

*Name*_____ *Company*_____

City *State*